Thymolipoma – the frontier between hamartoma and neoplasia?

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Abstract

Thymolipoma is an uncommon benign thymus lesion, with a partially deciphered etiopathogeny, being most frequently diagnosed in young patients, regardless of gender. Incidentally diagnosed in asymptomatic patients, larger thymolipomas lead to symptoms related to neighboring mediastinal structures compression, with an intensity which is correlated with the mass size. Our review presents the main epidemiological, pathogenic, clinicopathological and morphological characteristics of this rare pathology. Sometimes, thymolipomas may be associated with paraneoplastic syndromes, which are alleviated by the mass complete surgical resection. Imaging may orientate the diagnosis, which is certified by the microscopic examination of the resection specimens. Extensive thymectomy remains the current therapeutic option and new tools have been developed to increase the accuracy of the surgical procedure to avoid incidental lesions of the important elements of the anterior mediastinum. Although rare, thymolipomas should be considered in the differential diagnosis of mediastinal masses and of paraneoplastic syndromes.

Keywords: thymolipoma, mediastinal tumor, immunohistochemistry.

Introduction

Thymolipomas are relatively rare tumors, representing about 2–9% of thymic neoplasms [1–4] and show a slow development. They have been firstly described in literature by Lange, in 1916, and named “lipoma of the thymus” [5]. The term “thymolipoma” was proposed in 1949, by Hall, who suggested that this lesion is a true mixed tumor of fat and thymic tissue [6]. Thymolipoma is also known as benign thymoma, lipoma of the thymus, thymolipomatous hamartoma, mediastinal lipoma, or lipothymoma [7]. Most frequently located in anterior mediastinum, thymolipoma is diagnosed in patients with ages ranging from two to 67 years, without gender predilection [8, 9]. Microscopy shows a tumor mass composed by mature adipose tissue, without atypia, associated with foci of benign thymic tissue, mainly composed of epithelial cells [4, 10–13].

The symptomatology, acknowledged in approximatively 50% of patients, is closely related to location and the size of the tumor area [14, 15]. These lesions are incidental in asymptomatic patients, being detected in routine chest radiographs [16, 17]. The elective therapy is its surgical resection [9, 15, 18]. A series of theories have been launched during the last century, since its discovery, as attempts to explain their etiopathogeny.

Aim

In this context, our article is reviewing the most recent data regarding thymolipoma’s pathogeny and diagnosis. This lesion occurs more frequently in children and younger adults, being almost equally distributed among genders [15, 21]. Since its first description, in 1916, 122 cases had been reported, 67 of them in males and 55 in females, up to 1993, in patients with ages ranging between three to 76 years (mean 31.1 years), 23 cases being diagnosed in children less than 15 years old [22]. Overall, up to 2011, 200 cases of thymolipoma have been described in literature [23].

Its limited incidence in current practice is supported by the analysis of the publications reporting thymolipomas. Accordingly, 32 new cases of thymolipomas have been identified in articles published in extenso, in English language, which provided sufficient descriptive data, in PubMed, Scopus, and Web of Science databases, during 2011–2021 period of time. The gender distribution has been equal (16 males and 16 females), nine cases being children with ages less than 15 years. The patients’ age ranged between 6-month-old [18] and 82 years [12], as the extreme ages of patients diagnosed with thymolipoma in the mainstream publications, according to our knowledge (Figure 1).

The rare occurrence of these lesions is also supported by our experience, with a single incidental case in a male of 54 years, necroptically diagnosed [24].

To decipher the origin of this tumor, several theories have been proposed to explain their development. According to the neoplastic theory, thymolipomas are considered mesenchymal tumors (related to the adipocytic component) or a combined neoplasm of neoplastic thymic epithelial and fat components [8, 20]. This theory is based by the identification of enhanced carbohydrate antigen (CA) 19-9.
serum levels in some cases of thymolipoma [25, 26]. CA 19-9, normally produced in small quantities by thymus, shows an increased serum level due to the development of the neoplastic thymic component of the thymolipoma [17, 26].

The second theory is suggesting that thymolipomas are thymic hamartomas, formed by an admixture of white adipose tissue (30% to 80%) associated with thymus epithelium [20, 27]. Hamartomas have a slow growth, being able to develop anywhere in the body, but are usually found in the lung, breast, colon, hypothalamus or liver (von Meyenburg complex) [28, 29].

The incidence of most hamartomas is still unknown, except pulmonary hamartoma, which has an incidence of 0.25% [30]. Lung hamartomas are most often incidentally diagnosed after 40 years old, comprising 8% of all lung tumors, sometimes representing necrotical findings [30, 31]. Morphologically, hamartomas have similar features to benign tumors, being characterized by the disorganized growth of the local normal tissues, usually without signs of metastasis or local invasion, such aspects being also observed in thymolipomas. Common histological components of both lung hamartomas and thymolipomas are adipose tissue and epithelium, while the other elements are different.

Sometimes, hamartomas development is associated with phosphatase and tensin homolog (PTEN) gene mutation, a gene located on chromosome 10q23, involved in angiogenesis and cell proliferation control via downregulation of phosphatidylinositol-3-kinase (PI3K)/AKT/mammalian target of rapamycin (mTOR) pathway [32]. Most commonly recognized PTEN hamartoma tumor disorders include Cowden syndrome, Bannayan–Riley–Ruvalcaba syndrome, PTEN-related Proteus syndrome, and PTEN-related Proteus-like syndrome, all with a prevalence of 1/200 000 in the general population [32, 33].

Another theory is proposing that thymolipomas are the result of involution of thymic hyperplasia or of a regressed thymoma [8, 17]. In thymic hyperplasia involution, an increased thymic volume beyond the normal level for the patient’s age is noticed, because of an expansion of white adipose tissue, which progressively replaces thymus parenchyma [8, 20, 34]. The remnant thymic parenchyma is composed by epithelial cells and thymocytes (immature lymphocytes), sometimes with associated Hassall’s corpuscles [20]. Although it is difficult to measure if the thymic volume is larger than normal for the patients' age in medical practice, a normal rim of thymic component at the periphery of the lesion is usually absent in hyperplasia [8, 34].

It should not be overlooked that the thymus has a physiological involution with aging. Its development starts during the sixth week of gestation from the third and fourth pharyngeal pouches, common with that of the inferior parathyroid gland [35]. Its embryologic development in close relation to that of parathyroid is observed in DiGeorge syndrome, which is characterized by complete or partial absence of the third and fourth pharyngeal pouches and their derivatives – the parathyroid glands, thymus, and C-cells [36, 37]. Along with DiGeorge syndrome, thymic cyst, ectopic cervical thymus, hypopharyngeal duct cyst, and the undescended thymus are the most important thymic congenital anomalies with an unknown incidence, considering that these lesions are often asymptomatic [36, 37].

Exceptionally, a thymoma may suffer regression, as it has been mostly observed in thymolipomas associated with myasthenia gravis [8, 38].

Cytogenetics data of thymolipomas are limited, with a translocation between chromosomes 12 and 14 in a patient of 27 years, with a 46,XX karyotype, t(12;14)(q15q32) [8]. Another mention regarding aberrations/translocation of high mobility group AT-hook 2 (HMGA2) gene on chromosome 12q15, which occur in approximately two thirds of lipomas with abnormal karyotypes [15, 39], would suggest the idea that thymolipomas may represent a neoplasm of thymic adipose tissue, associated with areas of thymus parenchyma showing a normal or a regressed appearance [8, 15, 40].

Thymolipoma symptoms and diagnosis

Most patients diagnosed with thymolipoma are asymptomatic, being incidentally diagnosed during a
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routine thoracic X-ray [27, 41, 42] or even during autopsy [24].

When symptomatic, thymolipomas are manifested by signs of local compression by the tumor-like mass. Patients may accuse dyspnea, chest pain, weight loss, upper respiratory infections, chronic cough, or nausea and vomiting due to esophageal compression [8, 19, 43–46]. Thymolipomas may also lead to heart compression, followed by chronic heart failure [47].

Additionally, some patients with thymolipoma may have symptoms associated to paraneoplastic syndromes, such as myasthenia gravis, Graves’ disease, hypogammaglobulinemia, aplastic anemia, and lichen planus [15].

Thymolipoma–myasthenia gravis association is registered in approximately 2.8% to 50% of patients [15, 48], being mainly observed in older people [46, 48], which have autoantibodies against post-synaptic acetylcholine receptor (AChR Abs) [49]. However, according to data published by Poursadeghiard et al., in a 24-year-old patient diagnosed with thymolipoma-associated myasthenia gravis, AChR Abs have been absent but a high serum level of muscle-specific kinase (MuSK) has been detected [50]. While MuSK involvement in postsynaptic membrane support, with AChR clustering in the neuromuscular junction is known, the mechanism of thymus tissue initiation of MuSK serum increase is not completely deciphered [50].

It has been also noticed that some patients may develop a progressive anemia [46], probably induced by an autoimmune erythroid precursor destruction, according to Ferreira et al., who noticed a total anemia remission after thymolipoma surgical excision, in a 73-year-old patient [16]. The correlation between thymolipoma and blood cells count is also supported by another recent report, with normalization of lymphocytes count after surgical resection, in an 8-year-old female patient showing lymphocytosis, with normal lymphocyte morphology, 80% of them belonging to T-lymphocytes type [21].

Exceptional cases have been reported in literature, such as a thymoma development within a thymolipoma [51, 52] and an association between thymolipoma and thyrolipoma (adenolipoma of thyroid), with or without pharyngeal lipoma [53–55]. Although they are distinctive lesions, thymolipoma and thyrolipoma exhibit histopathological similitudes, suggesting a common etiology. According to Trites’s hypothesis, in these cases, a disturbance in the primitive foregut early development takes place, considering the common origin of both thymus and thyroid [54].

Thymolipomas diagnosis certification is based on microscopy, performed in most cases after the surgical excision of the mediastinal tumor mass. However, preoperative imagistic, such as chest radiography (X-ray), thoracic computed tomography (CT) or magnetic resonance imaging (MRI) may orientate the diagnosis [56–58]. Thus, thoracic CT provides valuable information regarding the location and structure of these tumor masses, such as their connection to the thymus anatomic region and its fat density, associated with strands of soft tissue [15, 51]. These features are supplemented by MRI data, characterized by tumor masses of high signal intensity equal to fat on T1-weighted images and T2-weighted images, with areas of intermediate signal intensity corresponding to thymic tissue or fibrous areas [18, 59].

Aside controversies, preoperative microscopic exam may be performed using fine-needle biopsy aspirate (FNAB), although not recommended in all patients’ protocol. This examination limits are highlighted by false positive results for malignancy, as in a 24-year-old patient who has been initially diagnosed by FNAB with well-differentiated liposarcoma instead of thymolipoma [60].

Thymolipoma morphology

Thymus is an encapsulated, bilobed organ, located in the anterior mediastinum, with 10–15 g weight at birth [61]. Physiologically, it is developing until puberty, when it reaches a weight of 34±10 g [61]. Following this age, a slow replacement of the thymic parenchyma with adipose tissue is preventing its microscopical recognition [61].

Thymolipomas occur most frequently in the cardiophrenic angle [62], often as large tumor masses, with an average up to 20 cm in diameter [63] and a weight over 500 g (70% of cases), at diagnosis [59]. The maximum weight of thymolipomas can be up to 16 kg, while a normal thymus of a 30-year-old patient weighs only about 25 g [27, 48].

According to Kitano et al., the weight of thymolipomas diagnosed in 122 patients included in an investigated group had a variable value, between 154 to 2235 g (mean, 709 g) [22]. According to our data regarding the thymolipomas weight measured in the 32 patients included in our group of study, it ranged between 40 g and 6000 g (mean about 2285 g).

Small size lesions maintain their location in the anterior mediastinum, while larger thymolipomas grow downward in a pedunculated fashion toward the diaphragm, sometimes covering the heart or insinuating itself between the heart, lungs, and diaphragm [59]. They may also adhere to pericardium or pleura [59]. Exceptionally rare, they may be located in the anterosuperior mediastinum or in the posterior mediastinum [59].

Macroscopically, thymolipomas are yellow masses with well-defined borders, a capsule, and lobulated contours [5, 43]. They exhibit a yellow, soft, homogeneous consistency on the section surface and generally do not show areas of necrosis or hemorrhage [5].

Microscopically, they are comprised of mature white adipose tissue, without cytological atypia or mitotic activity, associated with remnants of thymic tissue [4, 15]. The adipose tissue content of thymolipomas usually represents 50–85% of the lesion, but it has been reported to account for as much as 95% of the lesion [62]. The thymic tissue component may be variable, from strands of atrophic thymus epithelium to large areas containing inconspicuous normal thymic parenchyma, with Hassall’s corpuscles [15, 64] (Figures 2 and 3). Few myoid cells may by rarely identified
and malignant transformation or invasion has not been reported until now [8]. The origin of thymic myoid cells may be represented by the metaplastic change of reticulo-epithelial thymic cells, or from perithymic mesenchymal cells incorporated into the thymus, or from cells of the neural crest [65].

Added to the classical type of thymolipoma, other variants are described, such as thymofibrolipoma [66, 67] and thymoangiolipoma [15, 68]. Extensive areas of thick collagen fibers associated with islands of mature white adipose tissue are detected in thymofibrolipomas [67], while a variable proportion of mature fat tissue, thymic component, and blood vessels are observed in thymoangiolipomas [15]. In some cases, as in normal thymus, striated skeletal muscle or “myoid” cells may be detected in thymolipomas [20] (Figure 4).

**Figure 2** – General view of thymolipoma, exhibiting thymic areas within adipose tissue mass, lined by a capsule. Hematoxylin–Eosin (HE) staining, ×40.

**Figure 3** – Thymic component of thymolipoma, showing cortex and medulla containing Hassall’s bodies. HE staining, ×200.

**Figure 4** – Thymolipoma spectrum; added to common type of thymolipoma, thymofibrolipoma, and thymoangiolipoma represent rare lesions; occasionally, thymoma may develop within a thymolipoma or thymolipoma may be associated to thyrolipoma.

Immunohistochemical pattern of thymolipoma is characterized by mouse double minute 2 homolog (MDM2) negativity [4]. No cyclin-dependent kinase (CDK) 4 expression is evident in adipocytes, while cluster of differentiation (CD)1a, CD99, and terminal deoxynucleotid transferase (TdT) are highlighting the thymic lymphoid (immature) cells (Figures 5 and 6). Additionally, immunostaining for pan-cytokeratin (CK) AE1/AE3 and p63 or CK5/6, as immunomarkers of squamous differentiation, are positive in the normal thymic epithelium (Figures 7–10) [3]. If striated myoid cells are added in the cellular population of thymolipomas, they show myoglobin and desmin positivity, although they are negative for alpha-smooth muscle actin (α-SMA) [65].

**Thymolipoma differential diagnosis**

Thymolipomas differential diagnosis includes other mediastinal tumor and tumor-like masses, such as lipoma, lipomatosis of mediastinum, thymic hyperplasia, Morgagni hernia, thymoma, mature teratoma, including malignant neoplasms, such as liposarcoma, lymphoma, and thymic carcinoma [4, 8, 22, 69, 70].

The differential diagnosis between thymolipoma and lipoma is sometimes difficult. Generally, lipomas are large-size masses, located just above the diaphragm. In these instances, the identification of areas of thymic epithelial cells, which are absent in lipoma, added to immunohistochemistry, using markers such as CK and p63, is facilitating the thymolipoma diagnosis [15, 71–74].
Furthermore, in practice the differentiation between thymolipoma and mediastinal lipomatosis, a benign condition characterized by mediastinal accumulation of a large amount of mature fat tissues that may infiltrate skeletal muscle, without thymic parenchyma is a clue of diagnosis [75, 76].

Thymic hyperplasia represents thymic enlargement above normal limits for the corresponding age. Criteria such as capsule, dominant proportion of adipose tissue and of a peripheral rimming of normal thymus, are elements which support the diagnosis of thymolipoma against that of thymic hyperplasia [15, 77].
The differential between thymoma and thymolipoma is sometimes difficult. In these situations, the epithelial component is identified by characteristic immunomarkers, such as pan-CK AE1/AE3 and CK7 positivity, added to variable B-cell lymphoma 2 (Bcl-2) positivity, while CK20 and paired box 8 (PAX8) are negative [65, 78, 79]. Extremely rare, unusual associations have been reported in literature, such as thymolipoma and thymoma [50, 80, 81], thymoma and thymic carcinoma arising in a thymolipoma [82], instances that result in a high degree of differential diagnosis difficulty.

Mature teratoma is a mediastinal germ cell tumor, which may develop in anterior mediastinum. This may exhibit areas of white adipose tissue often associated with residual thymic tissue, and thus must be differentiated from thymolipoma. In this direction, the identification of sebaceous glands, cartilage, with or without gastrointestinal and respiratory epithelium may orientate the diagnosis towards a teratoma [15, 65, 71].

The differential diagnosis between thymolipoma and anterior mediastinum liposarcoma is facilitated by criteria that support the diagnosis of sarcomatous malignancy, such as size, myxoid degeneration, lipoblasts, and atypical spindle cells identification [15, 20, 73, 83].

Lymphomas of the mediastinum can originate either from the lymph nodes or the thymus. These display similar morphological and molecular features to their counterparts with other locations [84, 85]. Moreover, the differentiation between thymolipoma and a thymic carcinoma should be performed. Features, such as a non-encapsulated, firm mass, with gray-white cut surface, comprised of malignant cell exhibiting vesicular or hyperchromatic nuclei, with prominent nucleoli are orientating the diagnosis towards a thymic carcinoma. Immunohistochemically, the carcinoma cells are positive for pan-CK AE1/AE3, CD5, CK19 or CD70, but are negative for vimentin, CD99, and CD30 [79, 82, 86, 87] (Table 1).

### Thymolipoma treatment

The curative treatment of thymolipomas consists of complete resection of the tumoral mass by thoracotomy, sternotomy or video-assisted thoracoscropy, according to its location and size [21, 88] (Table 2).

### Table 1 – Differential diagnosis in thymolipomas

| Main macroscopic features | Main microscopic characteristics | Gene anomalies | IHC markers | References |
|---------------------------|---------------------------------|---------------|-------------|-----------|
| Lipoma                    | • large size masses             | • WAs and thin fibrous septa | • leptin    | [72–74]   |
|                           | • soft, lobular                 | • HMGA2       | • p16       |           |
|                           | • whitish/yellowish in color   | • HMGIc       | • MDM2      |           |
| Lipomatosis of mediastinum| • large amount of non-encapsulated mature fat tissues | • sheets and lobules of WAs that may infiltrate skeletal muscle | • PTEN     | [76]      |
| Thymic hyperplasia        | • thymus larger than normal limits for age (based on tables) | • normal thymic morphology | • p63      |           |
| Morgagni hernia           | • diaphragmatic hernias         | • –           | • XIAP      | [15, 77]  |
|                           | (anterior lateral and anterior parasternal defects) | |            |           |
| Thymoma                   | • lobulated                     | • lobulated architecture | • keratins (pan-CK AE1/AE3, CAM5.2, CK7) | [69]      |
|                           | • grey-tan color                | • neoplastic epithelial cells (polygonal or spindled) | • squamous differentiation (p40, p63, CK5/6), Bcl-2 variable | [65, 78, 79] |
|                           | • often encapsulated            | • variable numbers of lymphocytes (thymocytes) | • CK20 PAX8 |           |
|                           | • variable cystic changes       | • sometimes cyst(s) or focal cystic changes | • Bcl-2 variable (rare in type A thymoma) |           |
| Mature teratoma           | • encapsulated masses           | • haphazard admixture of mature tissues derived from 2 or 3 germinal layers | • keratin (pan-CK AE1/AE3) | [15, 65, 71] |
|                           | • cut surface with cystic spaces with fluid or hair, fat, bone, and cartilage | | • keratin (pan-CK AE1/AE3, CAM5.2, CK7) |           |
|                           | • haphazard admixture of mature tissues derived from 2 or 3 germinal layers | | • keratin (pan-CK AE1/AE3) |           |
| Liposarcoma (well differentiated or undifferentiated variant) | • large | • mature adipocytes, atypical spindle cells and multivacuolated lipoblasts in a myxoid to dense fibrous stroma | • classical or mosaic Klinefelter syndrome (47, XXY) | [15, 65, 71] |
|                           | • relatively circumscribed      | | • to describe the nature of immature components |           |
|                           | • areas of necrosis and hemorrhage | | |           |
| Lymphoma                  | • infiltrative mass             | • mature adipocytes, atypical spindle cells and multivacuolated lipoblasts in a myxoid to dense fibrous stroma | • MDM2 | [20, 73, 83] |
|                           | • fleshy appearance on cut surface | | • CDK4 |           |
|                           | • often with necrotic areas     | | • HMGAI2 |           |
|                           | • thymic cysts (may be present) | | • TSPAN31 |           |
|                           | • similar to their counterparts presenting in other sites | | |           |
|                           | • similar to their counterparts presenting in other sites | | |           |

(continued)
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| Case No. | Sex | Age [years] | Symptoms and signs | Imaging | Size [cm] | Weight [g] | Associated manifestations | Surgical approach | IHC markers | Positive | Negative | References |
|----------|-----|-------------|--------------------|---------|-----------|------------|---------------------------|-------------------|-------------|----------|----------|------------|
| 1. M 35 | M   | 30          | Chest discomfort   | Rx & CT | N/A       | 2585       | No                        | Surgical excision |            |          | [23]      |
| 2. M 49 | M   | 23          | Weakness and shortness of breath | Rx & CT | 34.3×23.4×14.6 | 4100       | B1, B2, and B3 thymomas  | Surgical excision |            |          | [51]      |
| 3. M 54 | M   | 22          | Asymptomatic       | Rx & CT | 12×10×3.5 | N/A        | No                        | Surgical excision |            |          | [65]      |
| 4. F 29 | F   | 28          | Dyspnea            | CT      | N/A       | 6000       | No                        | Surgical excision |            |          | [5]       |
| 5. M 21 | M   | 27          | Incidentally detected | Rx & CT | 16×10×15 | 1800       | No                        | Surgical excision |            |          | [5]       |
| 6. F 78 | F   | 20          | Persistent cervical pain and postprandial nausea and vomiting | CT & PET | 21×17×5 | 903        | No                        | Surgical excision |            |          | [43]      |
| 7. M 35 | M   | 28          | Chest pain         | Rx & CT | 4×6×12    | N/A        | No                        | Surgical excision |            |          | [10]      |
| 8. M 11 | M   | 23          | Recurrent chest pain | CT      | 5.2×4.1×2 | N/A        | No                        | Surgical excision |            |          | [41]      |
| 9. M 0.5| M   | 12          | Rapid breathing for the previous three months | CT      | N/A       | 840        | No                        | Surgical excision |            |          | [18]      |
| 10. M 11| M   | 17          | Painless progressively growing right cervical mass | Rx & CT | 17×9×3    | 1800       | No                        | Surgical excision |            |          | [42]      |
| 11. F 27| F   | 20          | Breathlessness on exertion | Rx & CT | 40×30×10 | 4500       | No                        | Surgical excision |            |          | [44]      |
| 12. F 2 | F   | 19          | Mild biphasic stridor | CT      | 14×10×7  | 354        | No                        | Surgical excision |            |          | [45]      |
| 13. F 30| F   | 19          | Shortness of breath | CT      | 20×17×15 (part 1) and 28×25×17 (part 2) | 4150       | Gardner’s syndrome        | Surgical excision |            |          | [11]      |
| 14. F 59| F   | 18          | Dyspnea            | CT      | 39        | 2800       | B3 thymoma                | Surgical excision |            |          | [52]      |
| 15. F 82| F   | 17          | Mild dyspnea and dysphagia | Rx & CT | 7.4×6.6×9.5 | N/A        | No                        | No consent for surgery |            |          | [12]      |
| 16. F 17| F   | 16          | Progressive dyspnea and nonproductive cough | Rx & CT | 12×10×8 | N/A        | No                        | Surgical excision |            |          | [56]      |
| 17. M 40| M   | 15          | Progressive dyspnea | Rx & CT | 40×33×8  | N/A        | No                        | Surgical excision |            |          | [57]      |
| 18. M 68| M   | 14          | Effort intolerance and fatigue | CT      | N/A       | N/A        | No                        | Surgical excision |            |          | [1]       |
| 19. M 35| M   | 13          | Chest pain, cough, dyspnea | Rx & CT | 31×21×8  | 5000       | No                        | Surgical excision |            |          | [13]      |
| 20. M 73| M   | 12          | Progressive shortness of breath | CT      | N/A       | N/A        | Pure red cell aplasia and Klinefelter syndrome | Surgical excision |            |          | [16]      |
| 21. F 4 | F   | 11          | Intermittent low-grade fever and cough | Rx & CT | 10        | N/A        | No                        | Surgical excision |            |          | [14]      |
| 22. M 3 | M   | 10          | High fever and productive cough | Rx & CT | 8×5×3.5 | N/A        | No                        | Surgical excision |            |          | [17]      |
| 23. F 24| F   | 9           | Plosis, dysphagia, dyspnea, and generalized weakness | CT      | 0.7×0.6  | N/A        | Myasthenia gravis          | Surgical excision |            |          | [50]      |
The difficulty of surgical intervention is depending on the tumor size and on the anatomic characteristics of the mediastinum. In this direction, a recent study revealed that the resection of thymic tumors by robotic surgery is safe, in perspective of precise dissection of mediastinum elements, particularly of those situated at the thymus superior poles [9]. Thus, this resection method allows not only the limitation of postsurgical complications, but also the reduction of the hospitalization period [9].

Thymolipomas do not exhibit recurrences after the surgical resection, thus the follow up is not necessary. Moreover, the remission of associated paraneoplastic syndromes, such as myasthenia gravis, after thymus resection is also reported [40].

### Conclusions

Thymolipoma is a rare benign lesion among the tumoral pathology of the anterior mediastinum, being composed by an admixture of mature white adipose tissue and thymic tissue. Thymolipoma has a slow growth, leading to the possibility to reach a large size at the moment of diagnosis. Occasionally, they may represent incidental forensic findings due to their asymptomatic development. Usually, thymolipoma diagnosis is suspected by CT and MRI imagistic findings, being certified by microscopic examination of the surgical resection specimen. Despite their rarity, thymolipomas must be considered in the differential diagnosis of masses of the anterior mediastinum.

## Conflict of interests

The authors declare that they have no conflict of interests.

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