УДК616-002.77-07-02:616.441(048.8)
DOI: http://doi.org/10.30978/CEES-2022-1-57

Rheumatic manifestations of thyroid pathology. Literature review

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Symptoms of musculoskeletal injury are frequently seen in thyroid disorders because the endocrine system has a complex influence on the structure and function of musculoskeletal tissues. The relationship between diseases of the thyroid gland and rheumatic pathology is significant and multifactorial. Endocrine disorders can involve a variety of tissues, including bones, muscles, nerves, and joints. Rheumatic disorders can be initially present and often come to the fore in the clinical picture or manifest during the course of endocrine diseases with a multitude of musculoskeletal complaints and signs. That is why, endocrine arthropathies, myopathies, and other зmusculoskeletal disorders should all be considered in the differential diagnosis of musculoskeletal injury.

We performed a systematic literature search in MedLine, PubMed, and Google Scholar searches for relevant publications published from August 2011 until October 2021. The terms used for the database search were «rheumatic manifestations», «hyperthyroidism» «hypothyroidism», «thyroid pathology», and «musculoskeletal manifestation».

Skeletal muscle is among the principal thyroid hormone's (TH) target tissue, where TH regulates proliferation, metabolism, differentiation, homeostasis, and growth. In physiological conditions, TH stimulates both protein synthesis and degradation, and an alteration in TH levels is often responsible for a specific myopathy. Intracellular TH concentrations are modulated in skeletal muscle by a family of enzymes named deiodinases; in particular, in muscle, deiodinases type 2 (D2) and type 3 (D3) are both present. D2 activates the prohormone T4 into the active form triiodothyronine (T3), whereas D3 inactivates both T4 and T3 by the removal of an inner ring iodine [1].

Regulation of the expression and activity of deiodinases constitutes a cell-autonomous, pre-receptor mechanism for controlling the intracellular concentration of T3. Skeletal muscle relaxation and contraction rates depend on T3 regulation of myosin expression and energy supplied by substrate oxidation in the mitochondria. The balance between D2 and D3 expression determines TH intracellular levels and thus influences the proliferation and differentiation of satellite cells, indicating an important role of TH in muscle repair and myogenesis. During critical illness, changes in TH levels, thyroid hormone receptor and deiodinase expression negatively affect skeletal muscle function and repair [2, 3].

Variety of musculoskeletal manifestations in thyroid diseases ranging from early growth defects during infancy to adult manifestations including myalgias, arthralgias, myopathy, bone disorders, acropachy and arthritis.

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In patients with hyperthyroidism may be next rheumatic problems [4—7]:

- painless proximal myopathy (70 %);
- shoulder periarthritis (adhesive shoulder capsulitis) (7 %);
- thyroid acropachy;
- osteoporosis, osteopenia.

Rheumatologic syndromes associated with hypothyroidism are [4, 6, 8]:

- tunnel (carpal) syndrome (15 % of hypothyroid patients).
- Raynaud's phenomenon.
- hypothyroid myopathy (affects almost 80 % of patients with hypothyroidism).
- arthropathy (25 % of patients with hypothyroidism). Hoffman's syndrome.

In patients with autoimmune thyroiditis, rheumatic manifestations (osteoarthritis, fibromyalgia, Raynaud's phenomenon, sicca symptoms, and arthritis) frequently occur even in the absence of overt thyroid dysfunction [7].

G. Giuffrida et al. [9] found in a cross-sectional study that 20 % of patients with Hashimoto's thyroiditis had clinical evidence of non-specifc rheumatic symptoms in the absence of a diagnosed rheumatic disease. When comparing patients with Hashimoto's thyroiditis accompanied by rheumatic manifestation (96 female and 4 male) with those affected by Hashimoto's thyroiditis alone, female sex was prevalent with a higher age at diagnosis. Hashimoto's thyroiditis patients with rheumatic manifestations (62 %) were mostly euthyroid and only 7 % were overtly hypothyroid. Polyarthralgias and fibromyalgia were the most frequent manifestations reported by control subjects, accounting for more than two-thirds of all rheumatic manifestations, followed by carpal tunnel syndrome, Raynaud's phenomenon, and sicca syndrome.

C. E. Tagoe et al. [10] found the rheumatic manifestations of euthyroid patients with chronic lymphocytic thyroiditis but without a well-defined connective tissue disease. Forty-six consecutive patients with anti-thyroid peroxidase (αTPO) and/or anti-thyroglobulin antibodies (αTG), and normal thyroid function in the absence of a well-defined connective tissue disease were included in a case–cohort study. Arthralgias were a presenting complaint in 98 % of patients. Fibromyalgia syndrome was found in 59 % of patients. Raynaud's phenomenon occurred in 28 % and sicca symptoms in 26 % of patients. Two patients had seronegative arthritis resembling rheumatoid arthritis. Arthritis was radiographically present in 88 %, affecting the spine in 45 % of patients. Thyroid-stimulating hormone levels were positively correlated with levels of anti-thyroid peroxidase αTPO, but not with erythrocyte sedimentation rate or anti-thyroglobulin antibody levels. A positive antinuclear antibody was found in 24 % of patients.

Thyroid acropachy occurs in 0.3 %—1 % of Graves' patients [11, 12] and is seen in cases of severe thyroid diseases, characterized by soft tissue swelling and clubbing of fingers and toes, small-joint pain, skin tightness, as well as a periosteal reaction of the bones of the hands and feet. Edema progresses over months or years with gradual curving and enlargement of the fingers [12, 13].

In the thyroid acropachy typically involves the metacarpal and phalangeal bones. This condition is strongly associated with ophthalmopathy and thyroid dermopathy. It can occur in all forms of autoimmune thyroid disorders whether euthyroid, hypothyroid or hyperthyroid patients. Pain is variable but usually mild [6, 14, 15].

The presence of dermopathy and acropachy is associated with the severity of the autoimmune process [16].

The exact etiology of thyroid acropachy is unknown, although it is thought to be caused by stimulating auto-antibodies to TSH and IGF-1 receptors that are implicated in the pathophysiology of Graves' thyrotoxicosis and ophthalmopathy [16, 17].

On radiographs thyroid acropachy manifests as prominent irregular and speculated periosteal new bone formation in the hands and feet with marked diffuse soft tissue edema [15].

Although hypothyroidism is associated with myalgia, hyperthyroidism is mainly associated with myopathy, such as muscle weakness and wasting. Symptoms of myopathy primarily involve the proximal muscles and rarely the pectoralis major muscle [18].

Thyrotoxic myopathy is usually painless and usually resolves after recovery from hyperthyroidism [19]. M. Kurihara et al. [20] described a case of myopathy in Graves' disease where the findings were atypical because there was no muscle weakness, no muscular symptoms, but only myalgia. The patient presented with only a chief complaint of myalgia with a 4-week history of this symptom. Patient's pain began to spread from the neck to the chest, resulting in extreme. The pain was sudden, intermittent, and generalized with no clear localization. The patient reported excessive sweating and weight loss (5kg/6months).

Yu-Ning Huang et al. [19] reported two patients with an acute onset of thyrotoxicosis presenting with severe myalgia and mild proximal weakness. The symptoms resolved in parallel with the achievement of euthyroidism, supporting hyperthyroidism as the cause of myalgia. The authors hypothesized that the myalgia is connected with muscle damage caused by energy deficiency during the acute onset of thyrotoxicosis.

N. Papanikolaou et al. [21] presented a case of a 50-year-old female with severe myalgia involving her proximal muscles for 3—4 weeks. She also reported mild thyrotoxic symptoms over the same time period. Examination revealed mild thyrotoxicosis, a moderate diffuse goiter and no eye signs. The clinical picture was dominated by muscle pain and tenderness involving mainly her proximal arms and legs, her calves and her fingers, requiring opiate analgesia. Muscle power and tendon reflexes were normal. Laboratory evaluation revealed undetectable serum TSH with raised free T4, free T3 and positive TSH receptor antibodies.

Thyrotoxic periodic paralysis (TPP) is a well-known complication of hyperthyroidism, characterized by recurrent episodes of transient, flaccid muscle paralysis [22]. The weakness of the muscles is painless and patients usually have hypokalemia and hyperthyroidism with elevations in the levels of triiodothyronine (T3) and thyroxine (T4). The muscle weakness is usually transient, and the patients in many cases suffer from recurrent episodes of muscle paralysis. This flaccid muscle paralysis predominantly affects the proximal and lower extremities group of muscles more than the distal and upper extremity muscles. This condition is one of the drastic complications of Graves's disease and, unfortunately, may require admission and treatment in the critical care units [23].

The pathogenesis of thyrotoxic periodic paralysis has long been thought to be related to increased Na+–K+ ATPase activity stimulated by thyroid hormone and/or hyperadrenergic activity and hyperinsulinemia. This mechanism alone, however, cannot adequately explain how hypokalemia occurs during acute attacks or the associated paradoxical depolarization of the resting membrane potential. Recent findings that loss of function mutations of the skeletal muscle-specific inward rectifying K+ (Kir) channel, Kir2.6, are associated with thyrotoxic periodic paralysis provide new insights into how reduced outward K+ efflux in skeletal muscle, from either channel mutations or inhibition by hormones (adrenalin or insulin), can lead to a vicious cycle of hypokalemia and paradoxical depolarization, which in turn, inactivates Na+ channels and causes muscle unexcitability and paralysis [24].

D. Sanyal et al. [25] describe three cases of thyrotoxic periodic paralysis due to painless thyroiditis presenting as acute quadriparesis. In the first case, goiter and clinical features of thyrotoxicosis were absent. In the second case, the patient had a grade 1 goiter and no signs of toxicity. Patients in the third case had tachycardia, fine tremors in both hands, and a grade 1 diffuse goiter. All three cases had elevated free T4, normal TSH receptor antibodies, serum creatine kinase and a collagen vascular profile. The authors accentuated that the hallmark of TPP is hypokalemia, usually less than 3.0 mmol/l, which was present in all three cases. The degree of initial hypokalemia has a direct correlation with the severity of paralysis but not with the thyroid hormone level. The authors emphasized that many patients with TPP may not have obvious signs and symptoms of thyrotoxicosis. That's why correct diagnosis and treatment may be delayed, and a thyroid function assay should be done routinely while evaluating patients with hypokalemic paralysis to distinguish TPP from other forms of hypokalemic paralysis.

TPP is a life-threatening condition in which paralysis can be reversed with quick potassium replacement and attacks can be stopped if hyperthyroidism is treated. Timely diagnosis and treatment are therefore prudent. While managing patients with flaccid paralysis, physicians should be aware of TPP as a potential etiology and investigate history to identify the triggering factors and provide timely and cautious potassium replacement therapy, as well as permanent approaches to treating thyrotoxicosis to prevent future TPP recurrences [26].

Both hyperthyroidism and hypothyroidism are associated with myopathy. According to A. Sindoni et al. [27] it is frequently underestimated that muscle symptoms may be the predominant or only clinical manifestation of hypothyroidism, raising the issue of a difficult differential diagnosis with other causes of myopathy. Elevated serum creatine kinase, which does not necessarily correlate with the severity of the myopathic symptoms, is certainly suggestive of muscle impairment, though it does not explain the cause.

Hoffman's syndrome, rhabdomyolysis, acute compartment syndrome are rare muscle symptoms linked with hypothyroidism [28, 29].

Hoffmann's syndrome is an unfrequent form of myopathy dependent on severe and protracted

hypothyroidism, characterized by proximal myopathy, hypertrophy of muscles and often painful muscle cramps. The pseudohypertrophy of the muscles seems to be linked to the accumulation of glycosaminoglycans in the muscles of the extremities, more marked on the limbs with the gastrocnemius muscle, conferring to the patient an athletic appearance. Muscle enzymes are elevated and hormonal correction of hypothyroidism causes a gradual improvement of myopathy with normalization of muscle enzymes. Muscle enzymes are elevated and hormonal correction of hypothyroidism causes a gradual improvement in myopathy with normalization of muscle enzymes [31]. It usually presents late in the course of the disease. The symptoms in most of the cases started from two months to thirteen years prior to presentation [32, 33].

D. Sharma et al. [34] presented the case of a young male with long-standing weakness and fatigue in the lower limb. He was diagnosed with having proximal muscle weakness and pseudohypertrophy of the calf muscles due to primary hypothyroidism. The muscle hypertrophy and muscle weakness receded following hormone replacement therapy with thyroid hormones. Creatine phosphokinase and lactate dehydrogenase levels are elevated in thyroid myopathy due to muscle degeneration. However, they do not correlate with the degree of weakness and show a gradual decline over weeks to months with the initiation of thyroid replacement therapy. The electrophysiological study in hypothyroid myopathy may show findings compatible with neurogenic, myogenic, or a mix of those patterns.

T. K. W. Lee et al. [35] describe a 34-year-old male who presented with proximal muscle weakness and non-pitting edema of the lower extremities. He initially visited the neurology department, where he was suspected of having polymyositis. Additional laboratory evaluation revealed profound autoimmune hypothyroidism and elevated muscle enzymes, including creatine kinase. The patient was started on levothyroxine treatment and, subsequently, clinical symptoms and biochemical parameters resolved with the treatment. The authors emphasize that this case highlights that hypothyroidism should be considered in the differential diagnosis of musculoskeletal symptoms even in the absence of overt manifestations of hypothyroidism.

Acute compartment syndrome is an uncommon complication of uncontrolled hypothyroidism. If unrecognized, this can lead to ischemia, necrosis and potential limb loss [30].

N. Hariri et al. [36] reported a 60-year-old male patient who was noncompliant with levothyroxine and developed bilateral lower extremity anterior compartment syndrome, relieved by four-compartment fasciotomy. M. C. Musielak [30] et al. describe compartment syndrome in all four extremities in a 49-year-old female who presented with the sudden onset of bilateral lower and upper extremity swelling and pain with paresthesias. Pertinent past history involves the patient discontinuing levothyroxine 3 months prior to entering to the hospital. Laboratory values were: TSH 164.73 uIU/ml (0.4—5 uIU/ml), creatine kinase 13 977 IU/l (25—200 IU/l) and myoglobin 602 ng/ml (0—115 ng/ml).

In recent years, cases of myalgia and elevated creatine kinase levels during the treatment of hyperthyroidism have been presented, and the side effects of anti-thyroid drugs and relative hypothyroidism have been proposed as explanations for these muscle symptoms [37].

Carbimazole is a commonly used antithyroid drug (ATD), which is associated with several well-established side effects. However, carbimazole-induced rhabdomyolysis is rarely reported in the literature.

N. O'Donnell et al. [38] report a 27-year-old male who presented with upper limb myalgia and significantly raised creatine kinase elevation, 1-month post commencement of carbimazole for Graves' disease. Carbimazole was ceased with subsequent clinical and biochemical improvement. The authors accentuated on some points, such as:

- Musculoskeletal complaints can be related to unidentified and untreated hyperthyroidism. However, it is important to keep in mind that the therapy for these diseases might lead to myopathies.
- Antithyroid drugs-induced myopathy should be considered when there is a temporal relationship between the introduction of ATDs and the onset of symptoms.
- If antithyroid drugs-induced myopathy is being considered, other causes of myopathy should still be outruled.
- Discontinuing potentially offending drugs as soon as possible may help to alleviate symptoms and avoid serious consequences.

R. Bou Khalilwe et al. describe an unusual case of myositis due to methimazole that was reversed after drug withdrawal [39].

The onset of symptomatic myopathy occurs anywhere within the range of one week to a maximum of two

months. Given the debilitating nature of myositis and the propensity of rhabdomyolysis to compromise renal function, one should be vigilant in looking out for the development of myositis in patients who have been newly administered antithyroid drugs. A. Y. Lim et al. [40] recommended taking a history for muscle weakness and myalgia at reviews, but do not deem it necessary to routinely screen the serum creatine kinase levels of every patient, given the rarity of the complication.

B. Uçan et al. [41] described a young male patient with Graves' disease who had an abnormal increase of creatine kinase level during treatment with methimazole. He experienced myalgia and elevated creatine kinase level 1 month after the initiation of methimazole. At the beginning of the myalgia, his free T4 level decreased to a normal range. After dose reduction of methimazole, the creatine kinase level decreased and his symptoms resolved.

The underlying pathophysiology of the side effects of ATD is not well understood, and many pathways have been proposed. Some postulated that ATD such as carbimazole used for patient can cause direct toxicity to skeletal myocytes, resulting in cell lysis and subsequent creatine kinase elevation. It's also stated that the commencement of ATD can result in swift decrements of thyroid hormone, which results in a relative hypothyroid state locally within the muscle itself [42].

Q. Li et al. [44] presented a primary hyperthyroidism patient with severe myalgia and obviously elevated creatine kinase due to rapid thyroid hormone TH correction.

Vitamin D deficiency can be an etiological factor for Graves' disease and non-specific musculoskeletal pain [45, 46]. On the other hand, patients with hypothyroidism suffer from deficiency in vitamin D3 and calcium, which in turn leads to osteoporosis [47].

The presumed association between serum vitamin D and thyroid disorders has been reported in various studies [48]. The existence of comparable steroid or nuclear hormone receptors for vitamin D and thyroid hormones causes this association. These findings demonstrate the relevance of vitamin D in thyroid function as well as the correlation between vitamin D insufficiency and thyroid disorders [49].

Adhesive capsulitis may be developing in patients with thyroid pathology. This condition, also known as «frozen shoulder», is characterized by a painful inflammatory process that results in a mechanical block in both the active and passive ranges of shoulder motion. Risk factors include diabetes and thyroid dysfunction [50, 51].

S. W. Huang et al. [52] in a 7-year longitudinal population-based case-controlled cohort study showed that hyperthyroid patients have a 1.22 times higher risk of developing adhesive capsulitis compared to the general population. Similar to the inflammatory and fibrosis process pathogenesis of adhesive capsulitis patients, hyperthyroid patients also present an inflammatory cytokine release and fibrosis phenomenon. Authors propose that cytokine and fibroblast proliferation contribute to not only the process of thyroid ophthalmopathy but also to adhesive capsulitis. This can explain why hyperthyroid patients are vulnerable to adhesive capsulitis. In addition to hyperthyroidism, the results showed that hyperlipidemia is another risk factor of adhesive capsulitis.

In patients with hyperthyroidism may be carpal tunnel syndrome (CTS). The syndrome is caused by compression of the median nerve as it travels through the wrist at the carpal tunnel. Patients with carpal tunnel syndrome may experience pain and paresthesia in the distribution of the median nerve, which includes the palmar aspects of the thumb, index finger, middle finger, and the radial half of the ring finger [53].

According to the British Society for Surgery of the Hand, the requirement of screening patients with CTS is considered to be necessary for thyroid dysfunction [54].

Screening for hypothyroidism in patients with CTS can prevent and halt the progress of these disorders, minimize their occurrence, and might be reversible at early stages after appropriate hormone replacement of thyroxin in newly diagnosed patients before considering a surgical approach [55].

S. S. Karne et al. [56] in their study showed that increased body mass index and presence of clinical symptoms and/or signs of CTS correlated independently with the presence of CTS in hypothyroidism. No correlation was found between gender, age of the patient, duration of disease, serum TSH level, etiology of the disease, thyroid hormone replacement therapy and the occurrence of CTS in hypothyroidism.

H. Taghavian et al. [57] in their study indicated that the prevalence of clinical and paraclinical symptoms of carpal tunnel syndrome is relatively high in hypothyroid patients. An important point in the study was that most of the hypothyroid patients with normal electromyography and nerve conduction velocity (EMG-NCV) test results had disorders based on Phalen's, Tinnel's

and compression tests. Therefore, it can be pointed out that EMG-NCV testing is not the definite and enough tool for diagnosis of CTS. Considering the high importance of early carpal tunnel syndrome CTS diagnosis in hypothyroid patients for preventing its reversible effects and the high prevalence of CTS in this study, early screening of hypothyroid patients for the diagnosis of carpal tunnel syndrome CTS is highly valuable.

Adequate amount of thyroid hormone is an essential requirement for normal development and maturity of bones in the early life as well as for the maintenance of the skeletal system (bone remodeling). Osteoporosis, one of the most common metabolic bone disorders, is strongly associated with hyperthyroidism (endogenous and exogenous), whereas association of the same disease with hypothyroidism is not quite established [58].

A complication of thyroid pathology is represented by an alteration of the bone metabolism, which can lead to osteoporosis and fragility fractures, which are known to have a high mortality rate [59].

Thyroid hormone deficiency in children results in a cessation of growth and bone maturation, whereas thyrotoxicosis accelerates these processes. In adults, thyrotoxicosis is an important and established cause of secondary osteoporosis, and an increased risk of fracture has now been demonstrated in subclinical hyperthyroidism. This clinical condition may affect bone metabolism resulting in decreased bone mineral density and increased risk of fracture, particularly in postmenopausal women [60, 61].

It is well known that overt hyperthyroidism has a detrimental effect on bone mass and fragility fractures due to a high bone turnover as documented by a shortened bone remodeling cycle, resulting in greater resorption, together with an increase in biochemical markers of bone resorption and bone formation. Bone formation is reducing at a faster rate than bone resorption. This causes osteoporosis by reducing bone mineralization, resulting in a net 10 % reduction in bone in each remodeling cycle [61, 62].

Decreased blood thyroid-stimulating hormone levels and hyperthyroidism are linked to an increased risk of hip and vertebral fractures, with the added impact of increased falls because muscular strength and coordination deteriorate [63, 64].

Thyroid hormone (T3) stimulates osteoclasts activity through nuclear receptors. Thyroid-stimulating hormone's local activities generally balance thyroid hormone impact on osteoclasts and increase osteoblast activity. In hyperthyroidism, this effect is missing [65, 66].

E. Soto-Pedre et al. [67] validate the association of genome-wide association study (GWAS)-identified loci and polygenic risk score with serum thyroid-stimulating hormone concentrations and the diagnosis of hypothyroidism. Then, the causal relationship between serum TSH and osteoporotic bone fracture risk was tested. This study suggests that genetically raised serum TSH concentrations are causally associated with decreased bone fracture risk in men.

T. Deng et al. [68] analyzed the serum levels of free T3, free T4, and TSH and the bone mineral density (BMD) levels of 114 men with normal thyroid function. In addition, osteoblasts from rat calvarial samples were treated with different doses of TSH for different lengths of time. The related gene and protein expression levels were investigated. A comparison of the BMD between the high-level and low-level serum TSH groups showed that the TSH serum concentration was positively correlated with BMD. TSH at concentrations of 10 mU/mL and 100 mU/mL significantly increased the messenger RNA (mRNA) levels of alkaline phosphatase, COI1 and Runx2. Bone morphogenetic protein activity was enhanced with both increased TSH concentration and increased time. The protein levels of Runx2 and osterix were increased in a dose-dependent manner. The authors concluded that circulating concentrations of TSH and BMD were positively correlated with normal thyroid function in males, and TSH promoted osteoblast proliferation and differentiation in rat primary osteoblasts.

H. W. Han et al. [69] presented a case report of multiple spine fractures in a young woman with postpartum thyroiditis and pregnancy osteoporosis. The authors concluded that postpartum thyroiditis might have played a role in aggravating post-pregnancy osteoporosis.

Arthropathy can often accompany both hypothyroidism and hyperthyroidism. Myxedematous arthropathy usually affects the knee and hand joints (metacarpophalangeal joints, proximal interphalangeal joints). Most often disorders are bilateral. The patient presents with swelling and stiffness. On exam, tenderness, synovial thickening and joint effusions can be present. The joint effusions can be large and characteristically lack erythema or warmth, unless secondary disease processes are present. Synovial thickening, ligamentous laxity, and knee effusions with a characteristic slow fluid wave (bulge sign) are common. The synovial fluid is noninflammatory with an increased viscosity owing to high hyaluronic acid levels giving a string sign of 1

foot to 2 feet instead of the normal 1 inch to 2 inches. Radiographs are typically normal [6].

H. Zoubeidi et al. [70] described the case of a patient presenting with painful arthropathy of the distal interphalangeal joints of the fingers which was the first manifestation of a severe unknown hypothyroidism. Rheumatic complaints started simultaneously with the first symptoms of hypothyroidism. The disappearance of joint pain and swelling, the clear improvement of deformation with thyroxine substitution and the absence of any evident underlying rheumatic disease suggest that hypothyroidism was responsible for the arthropathy in this patient.

CONCLUSIONS

Many endocrine pathologies are associated with well characterized rheumatic syndromes. Thyroid disorders, like other endocrine system problems, can cause a variety of rheumatic symptoms and has a wide range of musculoskeletal symptoms. Thyroid diseases commonly cause musculoskeletal complaints and may even present with rheumatic syndromes before the nature of the underlying endocrinopathy is apparent. On occasion, thyroid disorders can mimic some rheumatic diseases and leading to diagnostic errors. On the other hand, thyroid disorders can coexist with rheumatic diseases as well as rheumatic symptoms and findings.

Internists and rheumatologists should be vigilant about thyroid disorders, especially in patients with rheumatic manifestations without clear etiology. They should be well-versed in recognizing how thyroid illnesses influence the musculoskeletal system, as this will aid in avoiding diagnostic mistakes and provide early suspicion of thyroid pathology.

Conflicts of interest: none.

Authorship contributions: O. I. Voloshyn — conception and design, critical revision of the article; O. V. Glubochenko, I. V. Pankiv, I. V. Prysiazhniuk — acquisition of data, analysis and interpretation of data, drafting the article; V. G. Glubochenko — analysis of data, critical revision of the article.

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ABSTRACT

Rheumatic manifestations of thyroid pathology. Literature review

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Thyroid disease can be accompanied by a variety of rheumatic manifestations, ranging from early growth defects during infancy to adult manifestations such as arthralgias, myalgias, myopathy, acropachy, arthritis, osteoporosis. Objective — to provide a summarizing current literature on the analysis of a variety of musculoskeletal disorders in hyperthyroidism and hypothyroidism and possible mechanisms that explain this connection. Materials and methods. The authors conducted a systematic literature search for relevant Englishlanguage publications published between June 2011 and October 2021 in MedLine, PubMed, and Google Scholar. A variety of rheumatic manifestations in hyperthyroidism and hypothyroidism include: arthropathy, myopathy, adhesive shoulder capsulitis, thyroid acropachy, tunnel (carpal) syndrome, Raynaud's phenomenon, Hoffman's syndrome, osteoporosis. Thyroid diseases commonly cause musculoskeletal complaints and may even present with rheumatic syndromes before the nature of the underlying endocrinopathy is apparent. On occasion, thyroid disorders can mimic some rheumatic diseases and leading to diagnostic errors. On the other hand, thyroid disorders can coexist with rheumatic diseases as well as rheumatic symptoms and findings. Musculoskeletal complaints can be related to unidentified and untreated thyroid diseases. However, it is important to keep in mind that the therapy for these diseases might lead to myopathies. As a result, internists, endocrinologists, and rheumatologists should be well-versed in recognizing how thyroid illnesses influence the musculoskeletal system and must be aware of these correlations to ensure that the associated condition is not missed, or the diagnosis is not delayed. This will aid in avoiding diagnostic mistakes and provide early suspicion of thyroid pathology and correct treatment.

Keywords: rheumatic manifestations, hyperthyroidism, hypothyroidism, thyroid pathology, musculoskeletal syndrome.

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РЕЗЮМЕ

Ревматичні вияви тиреоїдної патології. Огляд літератури

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Захворювання щитоподібної залози можуть супроводжуватися різноманітними ревматичними виявами, починаючи від ранніх вад розвитку в дитинстві та закінчуючи такими виявами у дорослих, як артралгії, міалгії, міопатії, акропатії, артрити, остеопороз тощо. Мета огляду полягала в тому, щоб

узагальнити і проаналізувати дані літератури про різноманітні порушення опорно-рухового апарату при гіпертиреозі та гіпотиреозі, а також про можливі механізми їх розвитку і взаємозв'язку. Автори провели систематичний пошук відповідних англомовних публікацій за період з червня 2011 р. до жовтня 2021 р. у MedLine, PubMed та Google Scholar. До ревматичних виявів при гіпотиреоїдизмі та гіпертиреоїдизмі належать артропатія, міопатія, адгезивний капсуліт плеча, тиреоїдна акропатія, тунельний (зап'ястний) синдром, феномен Рейно, синдром Гофмана, остеопороз. Захворювання щитоподібної залози зазвичай спричиняють клінічну симптоматику ураження опорно-рухового апарату і можуть навіть виявлятися ревматичними синдромами до того, як природа основної ендокринопатії стане очевидною. Іноді захворювання щитоподібної залози можуть імітувати деякі ревматичні захворювання, що призводить до діагностичних помилок. З іншого боку, розлади щитоподібної залози можуть співіснувати з ревматичними захворюваннями, так само як і ревматична патологія з ураженнями щитоподібної залози. Важливо пам'ятати, що ревматичні скарги також можуть бути пов'язані з невиявленими та нелікованими захворюваннями щитоподібної залози і виявлятися у вигляді міопатій при некоректній терапії цих захворювань.

Лікарі-терапевти, ендокринологи та ревматологи мають знати, як захворювання щитоподібної залози впливають на скелетно-м'язову систему, що допоможе уникнути діагностичних помилок, на ранній стадії запідозрити тиреоїдну патологію та правильно розпочати лікування.

Ключові слова: ревматичні синдроми, гіпертиреоз, гіпотиреоз, патологія щитоподібної залози, скелетно-м'язові синдроми.

Дата надходження до редакції 17.02.2022 р.
Дата рецензування 02.03.2022 р.
Дата підписання статті до друку 16.03.2022 р.