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ANALYSIS OF THYROID DISORDERS IN PATIENTS WITH DOWN SYNDROME

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Abstract: Thyroid disorders are common in patients with Down syndrome, which can lead to significant impacts on the quality of life and cognitive development of these patients. Studies report a prevalence of 15-30% of thyroid disorders in patients with Down syndrome. Diagnosis of thyroid disorders in patients with Down syndrome is done using blood tests to measure levels of thyroid hormones and TSH. In addition, clinical evaluation is important to identify possible signs and symptoms of thyroid dysfunction, such as fatigue, weight gain or loss, intolerance to cold or heat, among others. To screen for thyroid disorders in patients with Down syndrome, the American Down Syndrome Society and the European Society recommend regular blood tests from birth and iodine prophylaxis to prevent thyroid dysfunction. The screening protocol must be individualized for each patient, taking into consideration, the factors such as age, family history and exposure to environmental risk factors. Treatment of hypothyroidism in patients with Down syndrome involves replacing thyroid hormones using medications such as levothyroxine. Furthermore, the adoption of non-pharmacological measures, such as diet and physical exercise, can help control the disease. The treatment of hyperthyroidism may involve the use of medications, such as propylthiouracil or methimazole, and, in more severe cases, treatment with radioactive iodine or surgery.

INTRODUCTION

Down syndrome (DS) is a genetic condition that affects about 1 in every 700 births and can be diagnosed during pregnancy through prenatal tests. The condition is caused by a trisomy on chromosome 21. Although DS is a genetic condition, it is not inherited from either parent. Rather, it is caused by a chromosomal abnormality that occurs during

gamete formation or early fetal development. The risk of having a child with Down syndrome increases as a woman ages, but most of these babies are born to women under 35.[1]

DS can have different degrees of severity, but is usually characterized by distinctive facial features, delayed cognitive development, heart and gastrointestinal problems. From the beginning of life, people with DS face challenges in their physical and cognitive development, such as difficulty in learning to speak, walk and perform fine motor tasks. However, these individuals possess many unique skills and talents, being highly creative, outgoing and sociable, achieving success in areas such as art, music and sport.[2]

People with DS can lead full and happy lives with the right support. Today, many organizations and resources are available to support these people and their families. These organizations offer information about the condition as well as emotional and practical support. Some schools also offer special programs to help children with Down syndrome develop their cognitive and social skills.[3-5] However, despite all the support provided, many individuals may have associated health problems, such as heart disease, gastrointestinal disorders, vision and/or hearing problems, as well as changes in thyroid hormone function, resulting in hyperthyroidism or hypothyroidism. [2,6-9]

THYROID DISORDERS IN DOWN SYNDROME

The thyroid is a butterfly-shaped gland that is located in the neck, producing essential hormones in regulating metabolism and other bodily functions. These hormones, known as T3 (triiodothyronine) and T4 (thyroxine), are essential for regulating metabolism, growth, and development in the body. Your hormone production is regulated by the hypothalamus and pituitary gland, which produce hormones that either stimulate or inhibit the release of your hormones. The hypothalamus produces thyrotropin-releasing hormone (TRH), which stimulates the pituitary to produce and release thyroid-stimulating hormone (TSH). TSH, in turn, stimulates the thyroid to produce and release the hormones T3 and T4 into the bloodstream.[10]

Thyroid hormones have many functions in the body, increasing the metabolic rate and helping to burn calories and maintain a healthy weight. They also affect body temperature, heart rate, blood pressure and nervous system function. Thyroid hormones are also essential for human growth and development, acting especially in the brain and central nervous system. When the thyroid does not work properly, disorders such as hyperthyroidism and hypothyroidism can occur, which can affect both people with Down syndrome and those without the condition. However, people with DS are more likely to develop these disorders than the general population. [11]

Thyroid disorders are present in about 15-30% of the DS population. Congenital hypothyroidism is the most common form of thyroid disorder in infants with DS, with an incidence of approximately 1 in 50 newborns. Furthermore, the incidence of acquired hypothyroidism is higher in people with the syndrome compared to the general population. According to a study published in the scientific journal "Endocrine Connections", the incidence of acquired hypothyroidism in people with these individuals is about 13.6%, six times higher than the incidence in the general population which is 2.5%.[12]

This is because the extra chromosome 21 that causes Down syndrome is also involved in thyroid regulation. The relationship between chromosome 21 and the thyroid is even more complex, as several genes located on chromosome 21 play important roles in its regulation.

The gene called DSCR1 is involved in regulating the thyroid's response to thyroid-stimulating hormone (TSH), which can affect the production of thyroid hormones. Another gene, called DYRK1A, can affect thyroid development and function during fetal development. As a result, people with Down syndrome are more likely to develop hypothyroidism, which is a decreased production of thyroid hormones. This can lead to symptoms such as fatigue, weight gain, feeling cold, and others.[13]

Other thyroid disorders, such as Graves' disease, are also more common in people with DS. Graves' disease is an autoimmune condition in which the immune system attacks the thyroid, resulting in an overproduction of thyroid hormones. Studies show that Graves' disease is twice as common in people in this group as in the general population. Graves' disease is an autoimmune condition in which its pathophysiology involves an abnormal immune response, which leads to the production of thyroid-stimulating antibodies, causing the thyroid to produce excess hormones.[14]

Normally, the production of thyroid hormones is regulated by the hypothalamus and pituitary gland in the brain. In Graves' disease, thyroid-stimulating antibodies (TSI) are produced by the immune system and bind to TSH receptors on the thyroid, leading to hyperthyroidism. TSIs can also affect other parts of the body, such as the eyes, leading to the development of Graves' eye disease. TSI is thought to bind to receptors in the eye socket, causing inflammation and increased production of fat and connective tissue. Additionally, the disease can affect the immune system in other ways, leading to an abnormal immune response and widespread inflammation in the body. This can lead to a range of symptoms, including fatigue, muscle weakness and skin problems.[15-17]

Thus, it is important to note that early detection and adequate treatment are essential to prevent complications related to thyroid disorders in people with Down syndrome. An early diagnosis can be made through regular blood tests. However, diagnosing and treating thyroid disorders in people with DS can be challenging, due to the possibility of atypical symptoms and other medical conditions that may mask symptoms.

DIAGNOSIS OF HYPOTHYROID SYNDROMES

The diagnosis of hypothyroidism involves a series of laboratory tests and clinical evaluation of the patient. Hypothyroidism is a condition in which the thyroid produces insufficient amounts of thyroid hormones, resulting in a range of symptoms such as fatigue, weight gain, feeling cold, depression, and skin and hair problems. The most common laboratory tests to diagnose hypothyroidism include measuring levels of TSH and thyroid hormones T3 and T4. TSH is produced by the pituitary gland in the brain and is responsible for stimulating the production of hormones by the thyroid. When thyroid hormone production is low, the pituitary gland increases TSH production to try to stimulate the thyroid to produce more hormones. Therefore, an elevated TSH level could be a sign of hypothyroidism.[11]

In addition, T3 and T4 levels are also evaluated. T4 is the main hormone produced by the thyroid and is converted to T3, which is the active form of the hormone. Low levels of T4 and T3 can be indicative of hypothyroidism. Other blood tests may be done to check for thyroid antibodies, such as anti-thyroglobulin and anti-thyroid peroxidase antibodies. The presence of these antibodies may indicate an autoimmune thyroid disease such as Hashimoto's thyroiditis.[10]

Reference values for TSH, T3 and T4

levels vary according to the laboratory and the analysis method used. However, there are standard reference values that are widely used by clinical laboratories. The reference value for TSH generally ranges from 0.4 to 4.0 mU/L. Values above this range may indicate hypothyroidism, while values below may indicate hyperthyroidism.

T3 is the active thyroid hormone produced by the conversion of T4 to T3 in peripheral tissues. The reference value for total T3 is usually 70 to 180 ng/dL, while the reference value for free T3 is 2.0 to 4.4 pg/mL. T4 is the main thyroid hormone produced by the thyroid. The reference value for total T4 is usually 4.5 to 12.5 mcg/dL, while the reference value for free T4 is 0.7 to 1.8 ng/dL.

DIAGNOSIS OF HYPERTHYROID SYNDROMES

The diagnosis of hyperthyroidism involves a combination of laboratory tests, clinical evaluation and imaging tests. Hyperthyroidism is a condition in which the thyroid produces too much thyroid hormone, resulting in a range of symptoms such as weight loss, increased heart rate, tremors, anxiety, and skin and hair problems.[11]

The most common laboratory tests to diagnose hyperthyroidism also include measuring TSH, T3 and T4 levels. Unlike hypothyroidism, hyperthyroidism is characterized by low levels of TSH and high levels of T3 and T4. This is because, with excessive production of hormones by the thyroid, the pituitary reduces the production of TSH to try to decrease the production of thyroid hormones. In addition, other blood tests may be performed to assess the presence of thyroid antibodies, such as anti-thyroglobulin and anti-thyroid peroxidase antibodies. The presence of these antibodies may indicate an autoimmune thyroid disease, such as Graves' disease.[11]

Clinical evaluation is also important for the diagnosis of hyperthyroidism. The anamnesis must include questions about the patient's symptoms, family and personal history of thyroid disease and the professional needs to perform a physical examination in order to detect signs such as weight loss, increased heart rate and tremors. In addition, imaging tests such as thyroid ultrasound may be performed to assess the size and structure of the thyroid. Thyroid scintigraphy may also be performed to assess thyroid activity and identify possible nodules or other abnormalities.

THYROID SYNDROME SCREENING PROTOCOL

The American Down Syndrome Society and the European Society recommend screening for thyroid disorders in babies with DS soon after birth. The American Down Syndrome Society's screening protocol involves a blood test to measure thyroid hormone levels in the first month of life. If test results show low levels of thyroid hormones, the baby is referred to a pediatric endocrinologist for further evaluation and treatment if necessary.[18]

The European Society also recommends a blood test to measure thyroid hormone levels in the first month of life. However, the European Society recommends that the test be repeated between weeks 2 and 4 of life and again between weeks 6 and 8. If a baby has abnormal results on any of the tests, they are referred to a pediatric endocrinologist for evaluation. additional and treatment. In addition, the European Society recommends that all babies with DS be evaluated for the presence of an ectopic thyroid gland, a condition where the thyroid does not develop normally and is located in an abnormal position. This is done using a thyroid ultrasound.

Current Brazilian guidelines on health supervision for children with DS suggest reviewing the results of newborn thyroid

function screening, repeating thyroid function tests at 6 months and 12 months of age, and then annually. Both societies agree that early screening for thyroid disorders is important in babies with DS due to the high risk of congenital hypothyroidism. From this, early treatment of the disease can prevent complications, such as delay in intellectual and physical development.

IODINE PROPHYLAXIS: WHAT DOES THE EVIDENCE SAY?

Iodine prophylaxis is a preventive measure that can be used to reduce the risk of thyroid disorders in patients with DS. According to the American Down Syndrome Society, iodine supplementation is recommended for patients with DS to prevent congenital hypothyroidism and decrease the risk of developing goiter and hypothyroidism later in life.[18]

Clinical studies have shown that iodine supplementation can be effective in preventing thyroid disorders in patients with DS. A randomized, double-blind, placebo-controlled study conducted in Turkey compared iodine supplementation versus placebo in patients with DS. Results showed that iodine supplementation significantly reduced the prevalence of goiter and hypothyroidism compared to the placebo group.[19] Another study, conducted in India, compared iodine supplementation versus placebo in DS patients aged between 5 and 18 years. Results showed that iodine supplementation significantly reduced the incidence of goiter and hypothyroidism compared to the placebo group.[20]

In Egypt, a clinical trial evaluated the effectiveness of iodine supplementation in patients with DS aged between 6 and 36 months. Results showed that iodine supplementation significantly reduced the prevalence of congenital hypothyroidism compared to the control group.[21] Thus, iodine supplementation is an effective preventive measure that may reduce the risk of thyroid disorders in patients with Down syndrome. Results from clinical studies provide evidence to support the use of iodine supplementation in patients with DS.

Initially, it is important to point out that iodine supplementation must be done with caution and under medical supervision, as inadequate iodine dosage can lead to complications such as hyperthyroidism. The American Down Syndrome Society recommends that iodine supplementation be started early in pregnancy in pregnant women with DS and continued throughout the patient's life. The recommended dosage for iodine is 150 to 200 micrograms per day for adults and 90 to 120 micrograms per day for children.

Despite reduced risks, iodine supplementation must not replace screening and monitoring tests for thyroid disorders, as described above. Iodine supplementation must be considered as an adjunct to regular medical follow-up. Additionally, iodine supplementation may be contraindicated in some cases, such as in patients with hyperthyroidism, Graves' disease, or thyroid nodules, as excess iodine can worsen these conditions.

MANAGEMENT OF HYPER AND HYPOTHYROIDISM IN PATIENTS WITH DS

Treatment of thyroid disorders in people with Down syndrome is similar to treatment in people without the condition. Treatment for hypothyroidism usually involves giving synthetic thyroid hormones to replace hormones that the thyroid is not producing. Treatment for hyperthyroidism may include medications that decrease thyroid hormone production or, in severe cases, surgical removal of the thyroid.[11]

According to the Brazilian Society of Endocrinology and Metabology (SBEM), the treatment of hypothyroidism is done with hormone replacement of thyroid hormones, through the administration of sodium levothyroxine. The treatment of hyperthyroidism involves reducing the production and/or release of thyroid hormones through antithyroid drugs and/or radioactive iodine.[22,23]

In the case of hypothyroidism, treatment with levothyroxine sodium must be individualized, taking into consideration, the factors such as age, weight, presence of other diseases and drug interactions. The aim of treatment is to normalize the levels of thyroid hormones in the blood and, consequently, relieve symptoms related to hypothyroidism, such as tiredness, weakness, weight gain and mood swings. In addition to pharmacological treatment, non-pharmacological treatment can be useful in controlling hypothyroidism. Among the non-pharmacological measures recommended by the SBEM are the regular practice of physical exercises, maintaining a balanced diet and iodine supplementation in cases of deficiency.[11]

In the case of hyperthyroidism, pharmacological treatment is with antithyroid drugs, such as methimazole and propylthiouracil, which reduce the production of thyroid hormones by the thyroid gland. In some cases, radioactive iodine therapy may also be indicated, with the aim of destroying part of the thyroid gland and reducing the production of thyroid hormones.

As with hypothyroidism, non-pharmacological treatment can also be useful in controlling hyperthyroidism. Among the non-pharmacological measures recommended by the SBEM are the restriction of consumption of foods rich in iodine, such as seafood and seaweed, and the regular practice of physical activities to reduce stress and control symptoms related to hyperthyroidism, such as palpitations and sweating. excessive.

CONCLUSION

Thyroid disorders are quite common conditions in individuals with Down syndrome and deserve special attention from health professionals who care for these patients. Thyroid dysfunction can significantly affect the quality of life of individuals with Down syndrome, since it is associated with a series of symptoms that can interfere with their physical and cognitive development.

In this context, the screening protocol for thyroid disorders in patients with Down syndrome, proposed by the American Society of Down Syndrome and the European Society, is an important tool to detect early changes in thyroid function and initiate adequate treatment as soon as possible. Iodine prophylaxis may also be a useful strategy to prevent thyroid dysfunction in patients with Down syndrome. In addition, the treatment of hypothyroidism and hyperthyroidism in patients with Down syndrome must be individualized and guided by a specialist. Pharmacological treatment, combined with non-pharmacological measures, can help to control symptoms and improve the quality of life of these patients.

Finally, it is important to highlight the importance of regular medical follow-up for patients with Down syndrome, including assessment of thyroid function. With a multidisciplinary approach and adequate treatment, it is possible to minimize the impacts of thyroid disorders on the lives of patients with Down syndrome and promote a healthier and happier life.

CONFLICT OF INTERESTS

There is not any.

FINANCING

The own researchers

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