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Urinary incontinence in patients of Duchenne syndrome

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ABSTRACT
Duchenne muscular dystrophy (DMD) is a neuromuscular pathology, being the most serious, rare and hereditary. Patients present muscoskeletal, respiratory, cardiac and orthopedic complications. Due to these muscular changes, these patients may develop urinary incontinence, which is loss of bladder control and any involuntary loss of urine. The objective of this study was to understand how urinary incontinence can affect the lives of sufferers. In the search for answers, we used a bibliographic review, where the data was found in a qualitative way, through scientific articles between the years 2003 and 2022, based on GOOGLE ACADÊMICO, PUD MED, SCIELO AND BOOKS. Studies and bibliographical analyzes were carried out where it was possible to state the proportion of interruptions in people who present the disease, such as disabling the achievement of goals of physiological functioning where a greater concentration is involved in the segment of urinary incontinence, in this way associated questions were practiced whether the The lives of individuals with this pathology and its changes can cause harm that can lead to psychological damage and integration. I believe that in the future it will be possible to achieve guidance and contributions that benefit people with the pathology.

Keywords: Duchenne Muscular Dystrophy, Genetics, Urinary Tract Symptoms and Urinary Incontinence.

1 INTRODUCTION

Duchenne Muscular Dystrophy (DMD) is a genetic disease linked to the X chromosome, generated by mutations in the gene located at position Xp21, which encodes the dystrophin protein, a cytoskeletal protein that is next to the sarcolemma, where it is responsible for maintaining the muscle fiber membrane essentially during muscle contraction. The failure of dystrophin proceeds in the destruction of the fibers (muscle necrosis), until the moment when it loses the ability to regenerate, and then it is replaced by fat and fibrosis in that place, causing muscle weakness as a consequence, affecting the entire skeletal and cardiac muscles. (FERNANDES et al., 2015, p.144).

With an incidence of 1 in every 3000-5000 male births, clinical manifestations begin to appear around 3 to 5 years of age, when the child denotes the development of frequent falls, less agility in gait, greater difficulty in climbing stairs and sitting on the floor (BUSHBY, Katharine 2010).

Laboratory evidence shows that there is no involvement of the spinal cord or peripheral nervous system and the neuromuscular junction, thus characterizing a defect especially of the deficiency or absence of the dystrophin protein. Over the years, this causes a progressive loss of functional skills that affect mobility such as climbing stairs, walking, standing, transferring objects and activities of daily living, consequently they are also compromised, dressing, bathing and eating become more difficult every day and the respiratory system is also affected (CASE LAURA et al., 2018; HIND DANIEL et al., 2017).

According to Freitas et al., (2014), the quality of life of patients with Duchenne dystrophy is affected by several reasons, he classifies in the first stage: physical, psychological, and social factors, and in the second stage: changes in somatic symptoms, sexual function, and personal productivity. One of the problems is urinary incontinence, which interferes due to muscle weakness in the pelvic floor.

Urinary incontinence is any loss of urine innovarily, the most common is when an injury occurs to the neck of the bladder, generating a sphincter deficiency. In addition, a strain or injury to the muscle is one of the factors for developing urinary incontinence (LIMA et al., 2014, v. 15, p. 141).

Kathryn R. (2007) reports that urinary problems are common in children and adults with DMD, the most frequent being urgency and daytime and nocturnal urinary incontinence.

For these reasons, this article is justified in the absence of studies, research, guidance and awareness about the pathology.

The purpose of this article is to understand how urinary incontinence in these patients with Duchenne Syndrome is affected. In order to analyze the proportion and specify the access to opportunities and activities daily in each period of the manifestation of the disease, describe the expected difficulties of the disease and guide the family members to have psychological support, relate the emotional and social issues during the trajectory of the disease, write the patient for a treatment for Urinary Incontinence and verify if the patients undergo therapies to help with all the effects of this syndrome.

2 METHODOLOGY

The present scientific research is a study of document analysis with a qualitative approach of bibliographic review, the search was carried out in electronic databases and books, such as Scielo, Google Scholar, PubMed. Key words such as 'Duchenne Muscular Dystrophy', 'Genetics' and 'Urinary Incontinence' were used.

After reading 30 articles, only 21 met the prevalence criteria for urinary incontinence in patients with Duchenne syndrome. According to the inclusion criteria, articles in English and Portuguese languages were added between the period from 2003 to 2022, which highlights compatibility with the proposed theme where these articles were selected for the construction of the literature review and in the exclusion criterion, we excluded articles that did not have the same context with the topic addressed.

3 LITERATURE REVIEW

3.1 DUCHENNE MUSCULAR DYSTROPHY

Duchenne Muscular Dystrophy has been the subject of numerous studies since 1830 Leung DG. et al., (2013) To date there is no specific cure according to NEGRONI, (2015), DMD is a genetic pathology related to the X chromosome and its incidence is 1 in every 3,500 – 5,000 live births.

The manifestations are in childhood and progressively the patient presents difficulties in performing movements in daily life such as: jumping, running and sitting due to the predominant loss of strength of the proximal muscles, the weakening of the waist and legs favors Gower's sign where the dystrophic individual will have difficulty getting up from the ground without support needing to climb his own legs to reach the orthostatic position (BUSHBY ET AL, . 2010)

Most of those affected have an increase in the calf musculature, called pseudohypertrophy. Over time, certain limitations progress, necessitating wheelchair use around 12 years of age. Despite strict measures of mechanical ventilation and respiratory care and tracheostomy, bone contractures, patients live on average to twenty years of age due to cardiorespiratory complications. (MAIA CRUZ et al., 2015)

3.2 PATHOGEN

DMD encodes dystrophin, an intracellular protein that expresses predominantly from smooth, skeletal, and cardiac muscles. It's also some neurons in the brain. In skeletal muscle, this protein is associated with the sarcolemma, a structure that helps in muscle stability (DAVIES KE, Nowak KJ, 2006)

3.3 PHENOTYPE AND NATURAL HISTORY

In men, DMD myopathy is progressive and has resulted from muscle degeneration and weakness. Firstly, with the pelvic girdle muscles and neck flexors. However, they occasionally manifest themselves in the neonatal period with growth and development retardation or hypotonia, usually between 3 and 5 years of age individuals present gait abnormalities. About 95% of patients with DMD have a cardiac impairment such as dilated cardiomyopathy or electrocardiographic

abnormalities, and 84% have this diagnosis proven at autopsy, 50% develop chronic heart failure, and it is rare for patients with DMD to complain of heart failure. Although dystrophies are also involved in smooth muscle, complications in this muscle are rare, but gastric dilatation and paralysis of the ilium and bladder may occur. Patients with DMD have an average IQ of approximately one standard trait deviation from the mean and approximately one third have some degree of retardation (NUSSBAUN, ROBERT L., THOMPSON & THOMPSON, 2008)

The severity of age at onset in females depends on the degree of deviation of X inactivation, if the X chromosome carrying the mutant DMD allele is active in the majority of cells, consequently females have shown signs of DMD, if the X chromosome carrying the normal DMD allele is predominantly active females will have little or no symptoms. Despite the clinical symptoms of skeletal muscle weakness, most women with heart disease have cardiac abnormalities with dilated cardiomyopathy, left ventricular dilatation and electrocardiographic abnormalities. (NUSSBAUN, ROBERT L., THOMPSON & THOMPSON, 2008).

3.4 CARDIAC FUNCTION

DMDs are the diseases that cause the most heart diseases due to protein alterations that are fundamental for the functioning of the heart muscle (BOUHOUCHR, ELHOUARIT, OUKERRAJL et al., 2008)

Progressive cardiomyopathy is the cause of morbidity and mortality of DMD, so within the multidisciplinary team, the cardiologist must monitor patients from the diagnosis, the indication is to start follow-up with echocardiogram within 6 years, during the investigation of cardiac function it is correct to perform electrocardiogram and echocardiogram exams periodically every 2 years until completing 10 years of age and annually after 10 years or at the onset of symptoms (BOUHOUCHR, ELHOUART, OUKERRAJL et al., 2008).

Patients with DMD generate cardiomyopathies and are often subject to arrhythmias. In cardiomyopathies, there is alteration of cardiac function in pumping blood, leading to signs of congestive heart failure, such as dyspnea, pulmonary edema, hepatomegaly, galloping rhythm, peripheral edema, angina, and symptoms such as fatigue, exercise intolerance (CAMMARATA-SCALISI, Camcho N et al, 2008, DRISCOLL DJ, 2006).

Cardiac dysfunction spreads mainly in the form of primary dilated cardiomyopathy, which follows fibrosis of the posterior wall of the left ventricle. If papillary muscle involvement is present, observe for significant mitral regurgitation. However, electrocardiographic changes have been demonstrated long before the onset of symptoms due to dystrophy in contraction leading to sarcolemma rupture (JAMES J, Kinnett K et al., 2011).

Screening by echocardiography should be performed periodically and medications such as angiotensin-converting enzyme (ACE) inhibitors should be initiated because this myopathy results in left ventricular systolic dysfunction and ultimately reduced ejection fraction (RAFAEL-FORTNEY JA, Chimanji NS., 2011).

3.5 RESPIRATORY FUNCTION

Neuromuscular diseases (NMD) are capable of intercepting body gas exchange, both in the pump phase of the respiratory system and in the maintenance of upper airway muscle tone, while disabling the protection of the airways caused by oropharyngeal incapacity, with the effect of mucociliary clearance and spinal support. The consequences presented by this pathology are: hypoventilation, upper airway obstruction, pulmonary aspiration, retention of secretions and infection of the lower airways, as well as the mechanical repercussions of progressive scoliosis (PERRIN C. et al., 2004).

The characteristic of the pathology such as respiratory muscle weakness (RMS) can contribute to low cough effectiveness, and ends up hindering the removal of secretion from the airways independently. This leads to an impairment in the breathing pattern and hypoventilation (FONSECA; AXE; FERRAZ, 2007). The study by Bushby et al., (2010) corroborates the previous research stating that consequently the impairment of this disease ends up generating the progressive loss of muscle strength of the entire skeletal muscle, respiratory muscle weakness and respiratory failure, with the effect of low lung volumes produced by thoracic deformities and the disadvantage of muscle weakness

The manifestations will be according to the onset of respiratory symptoms, which varies as a result of the disease and the onset of muscle weakness or the level of involvement of the rib cage. Acute respiratory failure is spread due to respiratory infection, with episodes with more recurrence of abrupt hospitalization, however, chronic respiratory failure is established with cases of death, more common with people with this disease. (CASCO J, et al., 2012).

At first , Yiu EM, et al., (2015) reported that boys who did not undergo treatment before they were 12 years old became wheelchair dependents, resulting in factors related to cardiorespiratory complications, even though their manifestations were present in the late adolescence and early 20s, in the end, due to the severity of the pathology, it caused death.

3.6 ORTHOPEDIC FUNCTION

Around 3 to 5 years of age, these individuals begin to have frequent falls, and present a characteristic of Gower's maneuver: where the proximal muscles result in weakening; when standing up, the child uses the elbows and knees, then they are extended and the hands and feet come together

to move the center of gravity to the legs; from then on the child will support one hand at a time, as if she were "climbing" herself. (MARCOS et al., 2015, p. 1)

Patients have several osteoarticular deformities, often progressive, such as accentuation of lumbar lordosis. As a result, they generate locomotor alterations, developing an anserine gait or also "duck walking". These patients end up walking with a lack of balance due to the insufficiency of the quadriceps muscle, affecting a greater load on the calf muscles (gastrocnemius and soleus) to compensate for the tendency of knee flexion in the stance phase, generating a hypertrophic calf. (DONEGÁ and RUZZON, 2014)

FABRIS, (2014) states that at 12 years of age, DMD patients end up confined to a wheelchair or depend in some way on the wheelchair. And consequently this patient will have bone deformities such as scoliosis, and in the ankle and elbow joints.

Scoliosis is one of the most common orthopedic problems in DMD, causing weakness of the respiratory muscles, deformity of the rib cage, consequently an ineffective cough which leads to respiratory complications (Kathryn R. 2007)

According to the study by Cruz-Guzmán, (2015) observed that patients with affected muscle limitation with the need to use a wheelchair have a lower concentration of pro-inflammatory cytokines (IL-1, TNF-α) and CK compared to younger patients in the initial phase of the disease, with independent ambulation, and assumes that the decrease in the concentration of these cytokines and CK can lead to muscle loss in patients with DMD. This hypothesis is also considered by other scholars who suggest that decreased CK levels in DMD patients is associated with a decrease in physical abilities and disease progression.

3.7 URINARY INCONTINENCE

Urinary incontinence is a pathology that is characterized by the invisible loss of urine, which has been affecting the quality of life of society, generating social and hygiene problems. During some periods of the evolution of the pathology, it can be considered a public health problem, as it affects the physical, psychic and societal aspects (ROCHA et al., 2017)

According to MORSELD1 et al., (2020, v. 15, p. 1) DMD is the impact of skeletal muscle weakening in adults, DMD becomes more pertinent as the probability of life increases. Therefore, weakening is one of the first clinical manifestations in these patients, and the effect of DMD on smooth muscle can help to expose comorbidities, particularly in the urinary tract. In males, there is a high prevalence of urinary tract signs and symptoms, which may be interconnected due to dystrophin within the bladder smooth muscle and upper urinary tract.

According to the study by BERTRAND et al., (2016) it points out that 50% of patients with DMD suffer from some urological conditions, or even report signs and symptoms, several diagnosed

symptoms have increased remarkably, such as urinary tract symptoms and incontinence. In the study, patients who had musculoskeletal disorders, such as scoliosis, who did not walk, or who had already undergone surgery to correct scoliosis were more likely to develop a urological diagnosis.

MacLeod et al, (2003) conducted a study with the objective of observing whether patients with DMD have any alterations in the urinary tract system, and the results were that 46 out of 88 men aged 3 to 31 years with DMD had reports of urinary complaints, the most common being incontinence. Ten subjects in the study underwent urodynamics which showed hyperreflex destroyer contractions in 8, 7 of whom had small bladder capacity. 7 underwent UDS, were treated with oxybutynia and most had a good response in reducing symptoms. It is highlighted as an early form of treatment and can benefit these patients and offer a quality of life to these patients.

The urinary system should be evaluated by specific examinations such as ultrasound, culture examination. When patients are away from home, to avoid embarrassment, one option is to use a pouch attached to a penile sheath (Kathryn R. 2007).

4 FINAL THOUGHTS

The presentation of this research portrays the aspects developed during the manifestation of DMD, such as urinary incontinence. A study and bibliographic analysis were carried out where it was possible to enunciate the proportion of the parameters in people who present the disease, such as incapacitating them to achieve goals of physiological functioning where the highest concentration is involved in the segment of urinary incontinence, in this way it was established associated questions if the life of individuals with such pathology and its alterations can generate harm that causes psychological damage and rapport. I believe that in the future it will be possible to achieve ES orientations and contributions that benefit people with the appropriate pathology.

Although the starting point involves issues of motor functions, the focus is associated with issues that make it impossible for DMD patients to establish relationships with others, maintaining the association that contests urinary incontinence. The purpose encompasses independence, cognition and communication, seeking more appropriate and desirable actions, seeking aspects that result in emotional and behavioral dissatisfaction in daily life.

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