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Review

Steinert syndrome and repercussions in dental medicine

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ABSTRACT

Steinert syndrome, also called myotonic dystrophy type 1, is a genetic disorder with autosomal dominant transmission characterized by myotonia and a multisystemic clinical picture that affects several tissues of the human body. The most common systemic phenotypes are: muscular, cardiac, respiratory, CNS, ocular, gynecological, digestive, orthopedical, as well as cognitive and psychological symptoms (cognitive decline). Muscles involved in voluntary movement are highly affected by myotonia especially distal muscles of upper limbs. These patients also show changes in face, chewing and pharynx muscles that can lead to swallowing and speech problems, dysphagia and in most cases to food aspiration and suffocation. Poor oral hygiene resulting from reduced motor mobility and reduced saliva flux can lead to gingival inflammation and periodontal disease. Other oral manifestations include disturbances at the temporomandibular articulation, dental occlusion changes and reduction in teeth number as a result of caries. Main causes of death are pneumonia and cardiac arrhythmias.

The etiopathogeny of this syndrome is still not clear, conditioning the existence of a specific treatment for this disease. Nowadays, treatments consist on the release of the existing symptoms, in an attempt to give a better life quality to patients. It is very important to implement actions that can prevent complications and consequently decrease death. Treatments should be applied in an early stage of the disease. Bronchoscopy and artificial respiration should be used to prevent pneumonia, and regular electrocardiographic monitoring should be done to evaluate defects in the conductive system. Several approaches have been applied to rehabilitate swallowing dysfunction and avoid aspiration like videofluoroscopy, postural techniques and adjustment of diet type.

It is the aim of this paper to clarify the ethiology, diagnosis, systemic and oral characteristics of the syndrome, as well as to discuss treatments to be applied according to patients affected organs.

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1. Introduction

Muscular dystrophies (MD) are a heterogeneous group of genetic neuromuscular disorders characterized by necrosis and progressive muscular weakness (Balasubramaniam et al., 2008).

Dystrophies are mainly caused by mutations in genes coding essential proteins for the integrity of muscular fibers affecting functional muscular contraction and relaxation. Clinical symptoms can vary from light to deep (Balasubramaniam et al., 2008).

These pathologies differ from each other concerning the type of muscles involved, etiopathogeny, age of onset, gravity and lesions localization, as well as symptoms evolution (Miranda & Stanich, 2007). Affected proteins also differ between them. These disorders are defined according to the underlying protein defect (dystrophinopathy, calpainopathy and others). Genes or gene products responsible for each of these diseases are not yet known in all forms of MD (Schara & Mortier, 2005).

There are diverse types of muscular dystrophies like: myotonic dystrophies (2 forms), dystrophinopathies (Becker muscular dystrophy and Duchenne muscular dystrophy), Emery-Dreifuss syndrome (3 forms), facioscapulohumeral muscular dystrophy, limb girdle muscular dystrophies (17 forms) and oculopharyngeal muscular dystrophy (Miranda & Stanich, 2007; Schara & Mortier, 2005; Wicklund, 2013).

Myotonic dystrophies are the most common form of muscular dystrophy in adults, having an incidence that varies among different populations: 1/20.000 in Japanese population, 1/8.000 in Caucasians and 1/475 in certain regions of Canada (Zerilnick, Torroni, Sherman, & Warren, 1995). This disorder is very rare in Africans, having only been described one Nigerian family with this type of dystrophy (Krahe et al., 1995).

Myotonic dystrophies have an autosomal dominant transmission pattern, with slow development and can be divided in type 1 myotonic dystrophy (MD1) or Steinert syndrome (SMD) and type 2 myotonic dystrophy (MD2) earlier known as Proximal Myotonic Myopathy (Planells, Molano, & Borrego, 2011; Tielemann et al., 2008; Tielemann et al., 2009). These dystrophies differ in the genetic cause: while SMD results from a triplet repeat (discussed later on), MD2 results from a CCTG expansion present in intron 1 of the gene coding zinc finger protein 9 (Tielemann et al., 2008; Tielemann et al., 2009).

SMD and MD2 share some features like muscular weakness, myotonia, cataracts, multiorgan involvement with cardiac conduction defects, insulin resistance and gonadal atrophy. Tielemann et al. (2008), Tielemann et al. (2009) were able to show that dysphagia (for liquids and solid food), abdominal pain and constipation, common symptoms in SMD, are similarly present in MD2 patients. However, dysphagia is milder in MD2 when compared with SMD (Tielemann et al., 2009).

These two disorders differ in the evidence of anticipation that is stronger in DM2, meaning earlier age of symptom onset in each generation. DM2 also shows higher intensity of muscular pain (Tielemann et al., 2008; Tielemann et al., 2009).

Steinert syndrome affects mainly muscular, cardiac, respiratory, CNS, ocular, endocrine, gynecological, digestive tissues as well as bones (Jaeger, 2004). Muscles of voluntary movement especially upper limbs are the most affected by myotonia. SMD patients also show alterations in face, chewing and pharynx muscles, resulting in swallowing and speech problems, dysphagia that can lead to food aspiration and suffocation (Die-Smulders et al., 1998). Patient's reduced motor mobility and reduced saliva flux contribute to poor oral hygiene, gingival inflammation and periodontal disease (Engvall, 2010). In these patients, the main causes of death are pneumonia and cardiac arrhythmias (Die-Smulders et al., 1998; Mathieu, Allard, Potvin, Pévost, & Bégin, 1999).

Due to the systemic picture of SMD manifestations, the main goal of this work is to deepen genetic factors, systemic and oral manifestations of the disorder, oral health and main treatments that can be applied to patients. The role of the dental doctor in early diagnosis of the syndrome and the difficulties present during a dental clinical procedure are also elucidated.

2. Materials and methods

For this work, several searches were performed using the websites: Pubmed, B-On, SciELO, Science Direct, as well as libraries of O'Porto Medicine Faculty (FMUP) and Fernando Pessoa University. The following keywords were used: "Neuromuscular disorders", "Myotonic Dystrophy", "Steinert Disease", "Management of myotonic dystrophy", "Health considerations", that were interconnected in several ways.

Inclusion criterion used was papers published after 2000 and written in English, Portuguese, French or Spanish. Papers previous to 2000 were also selected according with the pertinence of the theme. Another criterion used was that selected papers were new literature about the chosen theme.

Keyword:s: Neuromuscular disorders"; "Myotonic Dystrophy"; "Steinert Disease"; "Management of myotonic dystrophy"; "Health considerations"

3. Ethiology

SMD is an autosomal dominant disorder, showing incomplete penetrance and variable expression, therefore showing great variety of clinical symptoms. The diversity of symptoms include patients with late expression having only cataracts, and others having a congenital form with multisystemic expression (Harris, Moncrieff, & Johnson, 1996). This disorder shows anticipation expression, meaning different ages of symptom onset (Montero & Berger, 1999).

Most mutations responsible for this disorder are rare in the population when compared with normal alleles. SMD mutation consists of an expansion of a CTG triplet repeat localized at the untranslated 3′ end of the *dystrophia myotonica protein kinase* gene (*DMPK*), present in chromosome 19 (*locus* 19q.13.3). This gene codes for a protein kinase (myotonin) belonging to the serine/threonine kinases family (cAMP dependent kinases) that is expressed in smooth, skeletal and cardiac muscle (Brook et al., 1992). *DMPK* gene is also expressed at lower levels in brain and endocrine system (Jansen, Willems, & Coerwinkel, 1994).

There is a relationship between the expression pattern of the gene in different tissues and the phenotypic form of the disease (Jansen et al., 1994). Usually, symptoms appear between the 3rd