ANALYSIS OF REPORTS OF BRAIN MAGNETIC RESONANCE IMAGING EXAMS OF PATIENTS WITH MULTIPLE SCLEROSIS OF THE INSTITUTO DE NEUROLOGIA DE GOIÂNIA

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ABSTRACT: Multiple sclerosis is the most common of the demyelinating diseases of the central nervous system and is characterized by its nonspecific clinical aspects which makes the diagnosis difficult. The magnetic resonance is a highly sensitive method for detection of typical lesions of multiple sclerosis, for this reason the aim of this study was to evaluate retrospectively the reports of brain magnetic resonance exams of patients attended at the resonance service of the Instituto de Neurologia de Goiânia, in order to determine the incidence of positive cases for multiple sclerosis, and trace the epidemiological and socioeconomic profile of these patients. From the data analyzed, it was found that the incidence of diagnosis of multiple sclerosis was quite relevant in our sample, because not long ago the disease was considered rare in Brazil. There was a predominance in females and caucasians and the mean age observed among the patients of the study was 35.2 years. The socioeconomic conditions of patients analyzed in general are good. It is hoped that this study could contribute to a better understanding of the epidemiological characteristics of brazilian patients with multiple sclerosis, and also mobilize entities able to offer free magnetic resonance exams for the entire population.
Key words: Magnetic Resonance. Multiple Sclerosis. Epidemiological and social data.

RESUMO: A esclerose múltipla é a mais comum das doenças desmielinizantes do sistema nervoso central, sendo caracterizada por apresentar ampla variação dos seus aspectos clínicos, o que torna seu diagnóstico desafiante. Tendo em vista que a ressonância magnética é um método altamente sensível na detecção de lesões típicas de esclerose múltipla, o objetivo do presente estudo foi avaliar retrospectivamente, os laudos de exames de ressonância de crânio de pacientes atendidos no serviço de ressonância do Instituto de Neurologia de Goiânia, a fim de verificar a incidência de laudos positivos para esclerose múltipla, e traçar o perfil epidemiológico e socioeconômico desses pacientes. Pelos dados analisados, verificou-se que a incidência de diagnósticos de esclerose múltipla foi bastante relevante na amostra estudada, pois há bem pouco tempo a doença era considerada rara no Brasil. Houve predominância do gênero feminino e da etnia branca e a média de idade observada entre os pacientes do estudo foi de 35,2 anos. As condições socioeconômicas dos pacientes analisados em geral são boas. Espera-se com o presente estudo contribuir para um melhor entendimento das características epidemiológicas de pacientes brasileiros com esclerose múltipla, e ainda mobilizar órgãos competentes que sejam capazes de oferecer gratuitamente o exame de ressonância magnética para toda a população.
Palavras-chave: Ressonância Magnética. Esclerose Múltipla. Dados sociais e epidemiológicos.

INTRODUCTION

Among the demyelinating diseases of the central nervous system (CNS), multiple sclerosis (MS) is notable for its diversity of clinical aspects, which makes its diagnosis a challenge for most neurologists (FARLOW; BONNIN, 1993). Currently, MS is known as an autoimmune chronic inflammatory disease that causes destruction of the myelin sheath (MINGUETTI, 2001, HUIJBREGTS et al. 2004, LINK; HUANG, 2006).

Further of the non-specific clinical symptoms, another difficulty for the diagnosis of the disease is the absence of specific laboratory tests (PATY et al., 1988). In 2001, McDonald et al. have established some criteria to facilitate the diagnosis of MS. Although not internationally accepted, these criteria propose that the combination of clinical symptoms with investigations of typical lesions of MS through magnetic resonance imaging (MRI) from brain and cervical, study of evoked potentials and the presence of oligoclonal bands in the cerebrospinal fluid (CSF) can provide evidence leading to a more reliable diagnosis.

In chronological order, the first laboratory method used with the purpose of reinforce the clinical suspicion of MS was CSF analysis. In 1960, researchers recognized that the MS was associated with a CSF oligoclonal gammopathy, which implied in an increase of the immunoglobulin (IgG) (FARLOW; BONNIN, 1993). The study of evoked potentials (SEP), which detects lesions of the optic nerve, spinal cord injuries and brain stem lesions, started to be used in patients with MS since 1970. However, these lesions found by SEP not always represent lesions of MS (HAUSSEN, 2005). With the advent of neuroimaging techniques, from the seventies, it was possible to study in large detail the typical lesions of MS. Computed tomography did not contribute much to the diagnosis of the disease. In contrast, MRI has shown high sensitivity for lesions in the white matter (RINCK, 2008).

The MRI is a test that stands out for its noninvasive nature, for its high spatial resolution and does not use ionizing radiation (RAO et al., 1993). Some highly sensitive MRI techniques have been used to detect typical lesions of MS. These techniques include T2-weighted images, T1 and T1 enhanced with contrast based on gadolinium (BAKSHI et al., 2004). This means that MS lesions on T2-weighted images appear as liquid parts in white color and the fat appears in dark gray color, while in the lesions on T1 - weighted images occur the opposite, which is liquid is dark and what is fat is whiter (FRANCIS et al., 1995). This clear anatomical differentiation allows to MRI identify changes in the white matter and gray matter in the CNS.

However, MRI alone is not able to differentiate multiple sclerosis from some diseases, such as the Acute Disseminated Encephalomyelitis (ADEM). This occurs because the lesions of MS appear similar to lesions of ADEM in MRI, and the only difference is because the lesions of ADEM do not evolve as in MS (KESSELRING et al. 1990).

In addition to the differential diagnosis, MRI is used in the accompaniment of patients already diagnosed with MS, providing information about the spread or not of the lesions in time and space (BAKSHI et

137

al., 2004). This evolutionary control is important because indicates whether the treatment is effective in containing the natural evolution of the disease (CALABRESI, 2004).

Thus, the aim of this study was to evaluate retrospectively the reports of brain MRI exams of patients with MS attended at the service of resonance of the Instituto de Neurologia de Goiânia, in order to determine the incidence of positive reports for MS and trace the epidemiological and socioeconomic profile of these patients.

MATERIALS AND METHODS

The present study was approved by Human and Animal Research Ethics Committee of the Universidade Federal de Goiás (CEP/UFG nº 052/2009). Under authorization of the general director of Magnetic Resonance Clinic from the Instituto de Neurologia de Goiânia (ING), we analyzed all brain's MRI reports performed from 27th August to 31st of December, 2008. In numbers, we analyzed 1,236 reports of examinations, from which only 37 met the inclusion criteria: present diagnosis of demyelinating disease compatible with Multiple Sclerosis. Thus, reports of diagnostic from normal tests or related to other pathologies were excluded of this study.

From the reports of brain MRI analyzed, we computed the following data: gender, ethnicity, age, health plan and test

results. All MRI examinations were obtained from a 1.5 Tesla scanner.

The data collected in this study were analyzed using numerical parameters, graphical representations, parametric and/or nonparametric tests.

RESULTS

Of the 1,236 reports of MRI exams analyzed, 1199 had to be excluded from the study because they did not meet the inclusion criteria. Thus, we used a sample containg a total of 37 reports of tests from patients with MS, verifying a more incidence of changed diagnoses with other diseases (63.3%) and normal (33.7%) when compared to the studied sample (3%) (Graphic 1).
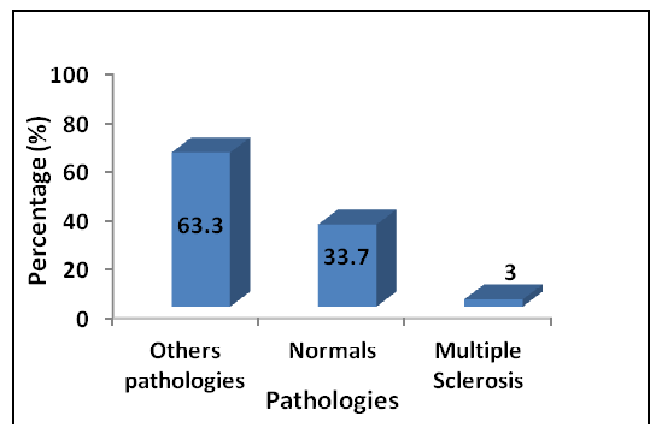
**Graphic 1-** Incidence of diagnoses in brain MRIs at ING.

As previously mentioned, for the definitive diagnosis of multiple sclerosis is necessary to correlate the imaging findings with clinical and laboratory data. But before the releasing of the resonance exams reports obtained in ING, this correlation is always performed. Therefore, all reports of MRI

138

selected for the present study represent positive cases of this disease.

From the total 37 patients with multiple sclerosis, 27 of them are female and 10 are male (ratio 2.7:1). As for the ethnicity, only in 31 of the 37 analyzed reports this information was provided, with 26 caucasian patients (70%) and 5 black (14%) (Table 1).

The average age of patients with demyelinating disease was 35.2 years. The minimum age observed among women was 14 years and the maximum 59, while in men the minimum was 18 and the maximum 63. Both genders also have different averages, as shown in Table 2.

In relation to the examination payment form, the data analyzed showed that seven (7) people have paid in cash or installment (Private) and 30 used the private health insurance, of which 23 had Unimed 3 Cassi 1 Correios, 1 Celgmed 1 Affego and 1 Bradesco Saúde (Figure 2).
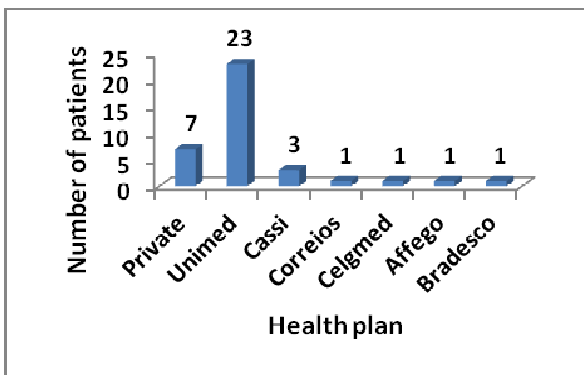
Graphic 2- Payment forms of Magnetic Resonance in the Instituto de Neurologia de Goiânia.

DISCUSSION

The magnetic resonance imaging is a very sensitive method for detection of lesions typical of multiple sclerosis, especially when compared to computed tomography (PATY et al., 1988; MCDONALD et al., 2001). However, confirmation of the diagnosis of MS depends on a rigorous clinical accompaniment, capable to differentiate it from other demyelinating diseases of the CNS, such as acute disseminated encephalomyelitis. The advantage of MRI in this case is, therefore, to exclude other diagnostic possibilities and to help the neurologist to find the correct diagnosis, fundamental to the success of the treatment.

The prevalence of MS varies considerably around the world and already has information that the number of cases worldwide exceeds 2,500,000 (PUGLIATTI et al., 2006; LEDER, 2008; MICHAEL, 2013). According Callegaro (2005, p.13), the South America is considered a region of low prevalence showing rate of less than five (5) cases per 100,000 inhabitants, while the cold climate countries like the United States of America and Canada showed more than 30 cases per 100,000 inhabitants. However, this incidence varies widely within the country, for reasons still unknown. In Brazil, for example, is 15 to 20 cases per 100,000 inhabitants from the states of Goiás and São Paulo. In the Northeast the index decrease to

two (2) until five (5) cases per 100,000 (FERREIRA et al., 2004; DINIZ, 2009).

The present study made at the Instituto de Neurologia de Goiânia not allow us to classify the state of Goiás and the city of Goiania as regions of low, medium or high prevalence of MS, because the sample used by us does not represent all positive cases of this disease found in the city or state. In addition, ING attends patients from all over the country.

In contrast, the study at the ING allow us to conclude that the number of patients diagnosed with MS was quite relevant. The high incidence of diagnosis of neurological diseases is often expected at ING, because the hospital is a reference in Brazil and in the world in the field of neurology. However, this number can be considered relevant for Brazil because recently (1970), before the advent of MRI, the diagnosis of MS was considered difficult and rare in the country. Thus, with the frequent use of MRI, several studies with patients who present MS have been reported in Brazil in recent years (ARRUDA et al. 2001; CALLEGARO, 2001; FERREIRA et al., 2004; GRZESIUK, 2006; RIBEIRO et al., 2011).

In this study, there was a predominance of female sex in relation to male, which is consistent with many other studies in the literature about this pathology, showing only differences in the incidence of a grade to another: Tomaz et al. (2005) found

2.7:1, Ribeiro et al. (2011) 2.5:1, and Carneiro et al. (2013) 3:1. Thus, the data used in this study demonstrate again that MS is more common in women.

As for the distribution by ethnicity, the multiple sclerosis is more common in caucasians. Epidemiological studies show low incidence among blacks, orientals and populations that apparently are resistant to the disease , as the eskimos and north amerindians (MOREIRA et al., 2000). In Brazil, due to genetic diversity and high index of miscegenation, is difficult to classify people with MS in caucasians, blacks or orientals, because we often find the ratings brown people, mulattos and others. Therefore, in this study we chose to include mulattos and blacks in the same classification, in the same way as Grzesiuk (2006) made in his work.

The study at ING did not allow us to assess all patients of the sample in terms of race, because not all reports consulted provided this information. Nevertheless, the predominance of caucasians with MS was evident in our study (70%), and agrees with several studies presented in the literature (ARRUDA et al., 2001; FRAGOSO; PERES, 2007; RIBEIRO et al., 2011; CARNEIRO et al., 2013). However, the ratio of black people found in this study (14%) may be considered relatively high when compared to some brazilian studies, such as Moreira et al. (2000) which found only 5% but used a sample of 302 patients. Even being an unusual fact in

the literature, the results obtained in this study in relation to the black race were also found in the study by Ferreira et al. (2004) in the city of Recife, Pernambuco, and in the study by Ribeiro et al. (2011) in Uberaba, Minas Gerais.

Therefore, the relatively high rate of patients of the black ethnicity (14%) found in this study may be due to the small size of the sample or could represent a characteristic of the population studied, because from the 1,236 reports analyzed in this study, 504 (40.8%) patients were brown people or blacks, 584 (47.2%) were caucasians and 148 (12%) had no such information.

Calabresi (2004) affirmed that the multiple sclerosis affects in more frequency people aged between 20 and 40 years old. Other researchers have also affirmed that the disease is rare before the puberty and after 60 years old, and presents higher peak around 30 years old (CALLEGARO, 2005, p.13; HAUSSEN, 2005). In our study, the mean age of patients was 35.2 years, but does not represent the average age of beginning of the disease. Although this value is in accordance with the literature, it could be even lower, as many patients of this study already had previous knowledge of the disease and they did MRI exams only for control.

Furthermore, the average age found by gender was 36.4 years for females and 33.9 for males, and the minimum age was found among women (14) and the maximum among

men (63). Moreira et al. (2000) found a mean of 29.6 years of age in their study of patients with MS and Grzsesiuk (2006) found a mean of 40.2 years, however, they did not perform this analysis by gender.

In this study we used as a criterion for assessing the economic power of the patients, the use or not of private health insurance for payment of the exam. Thus, we conclude that, in general, patients who paid the MRI without health plan (19%) had no financial conditions to possess a private health plan. There are other possibilities for the particular payment, for example, limitations of some health plans, non-acceptance of some plans by the RM service, or even high economic power of some patients. However, we associate this form of payment to the low economic power of these patients because it is among the most difficulties of access to an early diagnosis and treatment of MS in Brazil.

The high index of patients who did MRI with the assistance of health insurance (81%) demonstrates that the majority of patients who do the exam in the ING have good financial conditions, even because the hospital is private and no covenant with Single Health System (SUS), which is the public health system in Brazil. Fragoso and Peres (2007) found that the city of Santos (SP) had a relatively low prevalence of MS and most of their patients had better socioeconomic status. In this same study, the researchers suggested that MS prevalence in

141

the city could be greater than that showed by them, because many cases of the disease could not have been diagnosed in the city due to difficulties that some patients had mainly in the access to MRI exam.

Thus, the results obtained in this study allow us to conclude that the incidence of diagnosis of MS was quite relevant in the sample obtained, because not long ago the disease was considered rare in Brazil. There was a predominance of females and caucasians, and the mean age observed among the patients studied was 35.2 years, which does not represent the average age at which patients manifested disease. The socioeconomic conditions of the patients attended at ING in general are good. Therefore, this paper hopes to contribute to a better understanding of the epidemiological characteristics of Brazilian patients with MS, and also mobilize entities able to offer free MRI for the entire population, because the diagnosis and evolutionary control of MS fundamentally depend on this exam.

ACKNOWLEDGMENTS

REFERENCES

ARRUDA WO, SCOLA RH, TEIVE HAG AND WERNECK LC. Multiple Sclerosis: Report on 200 cases from Curitiba, Southern Brasil and comparison with other Brazilian series. Arq Neuropsiquiatr, 2001; 59: 165-170.

BAKSHI R, HUTTON GJ, MILLER JR AND RADUE EW. The use of magnetic resonance imaging in diagnosis and long-term management of multiple sclerosis. Neurology 2004; 63: 83-91.

CALABRESI, PA. Diagnosis and Management of Multiple Sclerosis. Am Fam Physician, 2004; 15: 1-14.

CALLEGARO D. Diagnóstico e Tratamento da Esclerose Múltipla. AMBCFM: Projeto Diretrizes 2001; 1: 1-10.

CALLEGARO D. Aspectos epidemiológicos. In: TILBERY CP. Esclerose Múltipla no Brasil: Aspectos Clínicos e Terapêuticos. 1. ed. São Paulo: Atheneu, 2005, p. 13.

CARNEIRO CC, DINIZ DS, CRUZ FFA, CHEN-CHEN L. Importância da Ressonância Magnética no diagnóstico e controle da Esclerose Múltipla: um estudo com pacientes da Associação Goiana de Esclerose Múltipla. RURD 2013; 11: 502-516.

DINIZ DS. Esclerose Múltipla: doença causa danos irreversíveis nas células nervosas. Neuro Notícia 2009; 1: 4-5.

FARLOW MR, BONNIN JM. Clinical and neuropathological features of multiple sclerosis. Neuroimaging Clin North Am, 1993; 3: 213-28.

FERREIRA MLB, MACHADO MIM, VILELA ML, GUEDES MJ, ATAÍDES-JUNIOR L, SANTOS S AND LAURENTINO SG. Epidemiologia de 118 casos de Esclerose Múltipla com seguimento de 15 anos no Centro de Referência do

Hospital da Restauração de Pernambuco. Arq Neuropsiquiatr 2004; 62: 1027-1032.

FRAGOSO YD AND PERES M. Prevalence of multiple sclerosis in city of Santos, SP. Rev Bras Epidemiol, 2007; 10: 479-482.

FRANCIS GS, EVANS AC, ARNOLD DL. Neuroimaging in multiple sclerosis. Neurol Clin 1995; 13: 147-171.

GRZESIUK AK. Características clínicas e epidemiológicas de 20 pacientes portadores de esclerose múltipla acompanhados em Cuiabá - Mato Grosso. Arq Neuropsiquiatr, 2006; 64: 635-638.

HAUSSEN SR. Esclerose Múltipla. In: PORTO, CC. Semiologia Médica. 5ª ed. Rio de Janeiro: Guanabara Koogan, 2005; 1171-1173.

HUIJBREGTS SCJ, KALKERS NF, SONNEVILLE LM, GROOT V, REULING IE AND POLMAN CH. Differences in cognitive impairment of relapsing remitting, secondary, and primary progressive MS. Neurology 2004; 63: 335-339.

KESSELRING J, MILLER DH AND ROB SA. Acute disseminated encephalomyelitis – MRI findings and the distinction from multiple sclerosis. Brain 1990; 113: 291-302.

LEDER, G. Tranquilidade na adaptação ao tratamento. Falando EM 2008; 1: 1-9.

LINK H AND HUANG YM. Oligoclonal bands in multiple sclerosis cerebrospinal fluid: an update on methodology and clinical usefulness. J Neuroimmunol, 2006; 180: 17-28.

MCDONALD et al. Guidelines from the International Panel on the Diagnosis of Multiple Sclerosis. Ann Neurol, 2001; 50: 121-27.

MICHAEL JO. Epidemiology and clinical features of multiple sclerosis in adults. Uptodate 2013; 21: 1689-1710.

MINGUETTI G. Ressonância Magnética na Esclerose Múltipla. Arq Neuropsiquiatr, 2001; 59: 563-569.

MOREIRA MA, FELIPE E, MENDES MF, TILBERY CP. Esclerose Múltipla: estudo descritivo de suas formas clínicas em 302 casos. Arq Neuropsiquiatr, 2000; 58: 460-466.

PATY DW et al. MRI in the diagnosis of MS: A prospective study with comparison of clinical evaluation, evoked potentials, oligoclonal banding, and CT. Neurology, 1988; 38: 180-85.

PUGLIATTI M, ROSATI G, CARTON H, RIISE T, DRULOVIC J, VÉCSEI L, MILANOV I. The epidemiology of multiple sclerosis in Europe. European J Neurol, 2006; 13: 700-722.

RAO SM et al. Functional magnetic resonance imaging of complex human movements. Neurology, 1993; 43, 2311-18.

REESE L, CARR TJ, NICHOLSON RL AND LEPP EK. Magnetic Resonance imaging for detections lesions of multiple sclerosis: comparison with computed tomography and clinical assessment. Can Med Assoc J, 1986; 135: 639-643.

RIBEIRO SBF, MAIA DF, RIBEIRO JB, CARDOSO FAG AND SILVA C. Clinical and epidemiological profile of patients with multiple sclerosis in Uberaba, Minas Gerais. Arq Neuropsiquiatr, 2011; 69: 184-187.

RINCK PA. A short history of magnetic resonance imaging. Spectrosc Eur, 2008; 20: 500-503.

TOMAZ A, BORGES FN, GANANÇA CF, CAMPOS CAH AND TILBERY CP. Sinais e sintomas associados a alterações otoneurológicas diagnosticadas ao exame vestibular computadorizado em pacientes com esclerose múltipla. Arq Neuropsiquiatr, 2005; 63: 837-842.