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The relation between cervical and thoracal disc herniations and multiple sclerosis plaques: A retrospective review

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Abstract

The aim of this study is to evaluate the relationship between cervical and thoracal disc herniations and the formation and activity of plaques in relapsing-remitting (R-R) multiple sclerosis (MS) patients. A retrospective study on R-R type MS diagnosed patients who also had cervical and thoracal disc herniations was carried out. 185 cervical and 136 thoracic in total 321 MR images of 104 (42 men, 62 women) MS patients with R-R type were evaluated retrospectively. In statistical analysis, significant relation ($p < 0.05$) between the localization of cervical herniations and MS plaques is found, which was not significant for thoracal localizations. In conclusion; this study supports the hypothesis that cervical disc herniations may be related with MS plaque formation by generating microtraumas causing disruption of blood brain barrier. Therefore early and effective treatment of disc herniations in MS patients may provide a better quality of life by preventing related disability.

Keywords: Multiple Sclerosis, cervical disc herniations, thoracal disc herniations, spinal cord compression

Introduction

Multiple sclerosis (MS) is a chronic and an autoimmune disease seen in central nervous system [1]. Underlying environmental and genetic factors run the pathogenesis. Symptoms of the disease are seen in early younghood ages but expected lifetime period does not shorten so much despite this fact so it can be said that MS is a disease that disturb the patient for years [2]. Multiple sclerosis (MS) has a distinguishing clinic like relapses occurred by inflammatory demyelination and neurological disability occurred by axonal damage [3]. The etiology of the disease is not correctly understood. In most MS patients, the disease shows symptoms in the earliest of third decade with neurologic dysfunctions, resulting by periods of partial or complete remission with clinical stability between relapses of the disease (relapsing–remitting MS). Except in MS patients with the R-R type of multiple sclerosis, progressive clinical disability, with or without superimposed relapses and remissions usually come after this phase [4,5].

Spinal cord herniation (SCH) is an uncommon progressive myelopathy that can be treated. SCH is seen in earliest of

third decades. It is divided into idiopathic, posttraumatic and iatrogenic groups according to the etiology. Idiopathic SCH takes place in the ventral or ventrolateral portion of the upper middle thoracic spine because of a spontaneous displacement through a defect of the duramater, continuous pressure, friction and/or traction on affected spinal cord portion cause focal myelopathy and cord atrophy [6].

Intervertebral disc herniation (IVDH) appear on both the cervical and thoracolumbar vertebral column and is an usual causative source of spinal cord injury (SCI) in animal species [7]. Hansen defined two types of IVDH and divided into two classes as Hansen type I or chondroid degeneration and Hansen type II or fibroid degeneration, which may cause IVDH and spinal cord compression [8]. IVDH may take place in any of the vertebral levels. Griffiths also reported another type of IVDH that may also occur in the cervical spine [9]. This extrusion type can be seen in patients who did hard trauma or hard exercise [10]. Spinal cord compression shows symptoms like MS, including spasticity, gaita incontinence, sensory loss, lower or upper extremity weakness, bowel and bladder dysfunction, Lhermitte sign, and upper limb or neck pain [11]. Coexisting MS and cervical stenosis (CS) make difficulties in diagnosis and treatment for both neurologists and spine surgeons about which disease is causative and which correct surgical strategy must be performed, because any given physiologic stress can induce an MS exacerbation [12].

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Spondylosis is a degenerative disease often appearing in the fifth decade. Degenerative disc disease that causes vertebral osteophytosis induces spinal cord compression, spinal canal stenosis and myelopathy. Spondylosis of the cervical spine is responsible for neurological abnormality related to myelopathy seen in 60 % of people over 50 years [13].

An association of MS with cervical spondylosis is reported in a few researches. In most cases, it is not certain that if the worsening condition is due to MS or spondylosis. The results done on MS patients with spondylosis have small number of patients, commonly pointing out the importance of decompressive surgery and often suggesting that operative approach provide a small benefit [14].

Subjects and Methods

Subjects

185 cervical and 136 thoracic MR images of 104 (42 men, 62 women) MS patients with R-R type were evaluated retrospectively. Patients who didn't have any MS plaques in their cervical or thoracic MR images were discriminated. The mean age of the patients was $41,9 \pm 10,2$ (20-65), the mean duration of the disease was $9,5 \pm 5,8$ years (1-24 years).

Collection of Data

The patient files were systematically detected. R-R type MS cases were included. All MR findings of the patients were dedected. The localizations of spinal MS plaques and spinal disc herniations were recorded to evaluate the association. The frequency of same localization of the cervical and thoracic plaques with MS plaque formation is evaluated by chi-square test.

Statistical Analysis

MR findings of the MS patients with R-R type were checked and these findings are statistically recorded. Sex, age, clinical symptoms, attack number, neurologic disability were not considered. Localization of the spinal cord plaques and disc herniations were determined. The causitive effect of the disc herniation on MS plaque formation was decided if the spinal cord

disc herniation was at the same localization with MS plaque. The chi-square test is applied for patients with cervical and thoracic plaque where MS plaque formation is observed.



Figure 1. Sagittal images of a patient with R-R MS

Results

Cervical or thoracic disc herniation and MS plaque association is evaluated statistically. In 49 patients' MS plaques and spinal cord compressions were at the same localization out of 84 patients who have both MS plaques and spinal cord compression in the cervical MR findings and this was statistically significant ($p < 0.05$). In 10 patients' MS plaques and disc herniations were at the same localization out of 34 patients who have both MS plaques and spinal cord compression in the thoracic MR findings and this was statistically insignificant ($p > 0.05$). Thus, it is found out that same localization of the cervical herniations with MS plaques was statistically significant but same localization of the thoracic herniations with MS plaques was statistically insignificant.

Table 1. Evaluated Cervical MR's foreffect of Cervical Plaques

	Cervical Plaque		Not Exists	Total
	Exists	Different Localization		
Disc exists	Same Localization 49 %48,5	Different Localization 14 %13,9	21 %20,8 5 %5,0	84 %83,2 84 %83,2
Disc not exists		12 %11,9 75	5 %5,0 26	17 %16,8 101

Table 2. Evaluated Thoracic MR's for effect of Thoracic Plaques

	Thoracal Plaque		Not Exists	Total
	Exists	Different Localization		
Disc exists	Same Localization 10 %11,6	Different Localization 12 %14,0	12 %14,0	34 %39,5
Disc not exists		30 %34,9 52	22 %25,6 34	34 %39,5 86

Table 3. Statistics for significance of localization of cervical and thoracic plaques for patients with MS plaque formation

	Same Localization	Different Localization	Total
Cervical Plaque	49 %57,6	14 %16,5	63
Thoracic Plaque	10 %11,8	12 %14,1	22
Total	59	26	85

Discussion

Multiple sclerosis is often appearing between the ages of 18 and 45, and usually seen in women. MS has an irregular clinic presentation and if it is not treated, it may result in progressive neurologic deterioration [15]. Unlike the thoughts which consider MS as an autoimmune disease in the past days, MS is evaluated as a disease with progressive neurodegeneration in addition to inflammatory processes, in the present study [16]. Poser has discussed central nervous system trauma role in the formation or enlargement of MS plaques [17]. Theory that addressing physical trauma for onset or exacerbation of MS were suggested in the mid 1860s by Charcot [18]. Some scientists suggest that physical trauma at the spinal cord and/or the brain may cause a damage in the blood–brain barrier that may contribute to development of MS plaques in people who are genetically at risk. Distrupted barrier gives a passage through the central nervous system that resulting in accumulation of autoreactive immune cells and formation of the plauques [17]. The association of MS with spondylosis was reported by Brian and Wilkinson in 1957 [14]. In MS patients spinal compression at the disc may impair the normal water inflow and nutrient transportation process which leads to apoptosis and some conditions like cell adhesion, chemotaxis and opsonization [19]. Fibronectin which is the large glycoprotein portion of the nucleus pulposus plays a significant role in the organisation of ECM (Extracellular matrix) proteins [20]. Excess mechanical loading on the disc may fragmantate fibronectin [21]. It is found that fibronectin is expressed abnormally in acute MS lesions of the brain resulting in the formation of dense networks and this represents a positive correlation with the degree of inflammation. Fibronectin, aggrecan and neurocan were detected in the “glial scar” of MS lesions and are considered to impair the oligodendrocyte remyelination and outgrowth [22,23]. Fibronectin has been primarily detected in the vessel walls and the amount of it correlates with the degree of inflammation. Extracellular fibronectin was found in active plaques and necrotic lesions. Fibronectin may help monocyte adhesion to endothelial cell luminal surfaces, trigger migration of mononuclear cells, and stimulate myelin phagocytosis in MS lesions [23].

Conclusion

It is hypothesized that cervical and thoracic disc herniations may play a role in the onset of MS plaques formation. Cervical and thoracic herniations and even small protrusions may narrow the spinal canal and make microtrauma on spinal cord during head and vertebra extension-flexion movements. The collected data indicates that the cervical disc herniations may play a role in MS plaques formation because the cervical spinal cord is more exposed to trauma. The relationship between thoracic disc herniations and thoracic MS plaques found statistically insignificant which can be attributed to less extension-flexion movement of the thoracic spinal cord and less incidence of whiplash trauma and microtrauma in the thoracic region.

Worsening symptoms seen in MS patients may be due to

radiologically unidentified cervical and thoracic disc herniation involvement and this manifestation makes the decision of treatment more difficult. Further research may identify that there is a strong relationship between disc herniations and the MS plaques formation and therefore the importance of effective treatment of disc compression is emphasized.

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