ABSTRACT

**Objective**: to compare the bone mineral density of the lumbar spine and femoral neck in men with spinal cord injury physically active. **Methods**: it is a cross-sectional study involving 53 individuals. There were conducted the tests one-way ANOVA, Tukey's post-hoc and post-hoc Games-Howell contained in the statistical package SPSS for Windows, version 16.0 and the level of significance adopted was p<0.05. The study was approved by the Ethics Committee in Research, Protocol n° 188/2008. **Results**: the Body Mass Charge had a significant difference between the sedentary spinal cord of injured patients and active and sedentary controls. The Bone Mineral Density spine L1-L4 had no statistical significant difference between the experimental and control groups, the femur was not significantly different among the spinal cord injured, but with these, with controls; the L1-L4 of the spinal cord injured and their controls did not differ. **Conclusion**: Femoral Bone Mineral Density of spinal cord injured, independent of conduct or not physical activity, is lower, compared to people without disabilities. **Descriptors**: Spinal Cord Injuries; Physical Activity; Bone Mineral Density.

RESUMO

**Objetivo**: comparar a densidade mineral óssea da coluna lombar e do colo do fêmur em homens com lesão na medula espinhal praticantes de atividade física. **Método**: estudo transversal com a participação de 53 indivíduos. Realizou-se os testes ANOVA one-way, o post-hoc Tukey e o post-hoc Games-Howell contidos no pacote estatístico SPSS para Windows, versão 16.0 e o nível de significância adotado foi p<0.05. O estudo foi aprovado pelo Comitê de Ética em Pesquisas, Protocolo n° 188/2008. **Resultados**: o Índice de Massa Corporal teve diferença significativa entre os lesados, controles sedentários e controles ativos e sedentários. A Densidade Mineral Óssea da coluna L1-L4 não teve diferença estatisticamente significativa entre os grupos experimentais e controle; a do fêmur não teve diferença significativa entre os lesados, mas destes com os controles; a da coluna L1-L4 dos lesados e seus controles não se diferem. **Conclusão**: a Densidade Mineral Óssea do fêmur dos lesados, independentes de realizarem ou não atividade física, é menor, comparado às pessoas sem deficiência física. **Descriptors**: Traumatismos da Medula Espinal; Atividade Física; Densidade Mineral Óssea.

RESUMEN

**Objetivo**: comparar la densidad mineral ósea de la columna lumbar y del cuello fémur en hombres con lesión en la médula espinal físicamente activos. **Método**: un estudio transversal que incluyó a 53 sujetos. Hemos llevado a cabo los testes de ANOVA one-way, post-hoc Tukey y el post-hoc Games-Howell contenidos en el paquete estadístico SPSS para Windows, versión 16.0 y el nivel de significación fue de p<0.05. El estudio fue aprobado por el Comité de Ética en Investigación, Protocolo n° 188/2008. **Resultados**: el Índice de Masa Corporal acusó diferencia significativa entre los pacientes sedentarios con la médula espinal lesionada y controles activos y sedentarios. La Densidad Mineral Ósea de columna vertebral L1-L4 no tuvo diferencia estadísticamente significativa entre los grupos experimentales y de control, el fémur no fue significativamente diferente entre los lesionados, pero de estos con controles; de la espina dorsal L1-L4 de los lesionados y sus controles no difirieron. **Conclusión**: la Densidad Mineral Ósea de los lesionados de medula, independientemente de practicaren o no actividad física, es menor en comparación con las personas sin discapacidad. **Descriptors**: Lesiones de la Médula Espinal; Actividad Física; Densidad Mineral Ósea.

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INTRODUCTION

The spinal cord injury remains one of the highest rates of injury hospitalization in rehabilitation hospitals. On average 63, 3% of people who were hospitalized at the network Sarah of Hospitals of Rehabilitation (Brasilia, Salvador, Belo Horizonte and São Luís) in the first half of 2009 were with spinal cord injury.

A spinal cord injury can be characterized as traumatic: by motor vehicle accidents, violence, falls and water sports and non-traumatic: include, but are not limited to, neoplasms, bone disease, infection, arteriovenous malformation, stenosis, spondylosis, arachnoiditis and congenital anomalies. Spinal cord injury affects motor strength, sensitivity and control of bladder, bowel and sexual function.

Lesions in the bone, 15 to 20% occur as a result of fractures of the spine, and in Brazil we have about 40 new cases per million inhabitants per year, for a total of six to eight thousand cases per year, which is the approximate cost 300 million dollars per year.

Osteoporosis is a major public health problem by having this multifactorial may also be present in spinal cord injuries. With bone demineralization, fracture risk increases may cause deformities, ulcers, and limitations for rehabilitation, generating situations unwieldy, both for individuals affected and for their families and caregivers, and the resulting high cost of care and with hospitalizations.

Disabled people generally get positive effects on your physical, mental and social practice of regular physical activity and recreational sports or adapted, whether or not the sport purposes. Physical activity can play a very important role in people with spinal cord injury.

In Brazil, albeit timidly, there are few studies evaluating quality of life in people with spinal cord injuries, which are of great importance for these. Quality of life is a dynamic concept and quite wide, directing several studies in health, even as regards people with spinal cord injury.

Hence it is clear that the need to expand on the issue in question with a view to promoting quality of life of this population.

The aim of this study is to compare the bone mineral density of the lumbar spine and femoral neck in men with spinal cord injury physically active.

METHOD

A cross-sectional study, which explores the cause-effect relationship where the same are observed simultaneously.

The population consisted of men aged 20 to 56 years old, with spinal cord injury, belonging to charities of the Federal District. The sample consisted of 53 male subjects, being 26 subjects with spinal cord injury and 27 subjects without spinal cord injury to compose the control group. Table 1 summarizes the description of the population.

| Table 1. Age and anthropometric characteristics of the participants (average ± standard deviation). |
|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|
| **Experimental**                                | **Control**                                      |                                                  |                                                  |
| **Age**                                         | **LMA**                                          | **LMS**                                          | **CA**                                           | **CS**                                           |
|                                                  | 37,88±6                                         | 35,2                                             | 38,8                                             | 43,10±6                                          |
|                                                  | 6,712                                           | 7,9                                              | 2±6                                              | 6,350                                            |
| **MCT (KG)**                                    | 70,762                                          | 63,9                                             | 41,9                                             | 76,050                                           |
| **±11,46**                                      | 90±3                                             | 975                                              | 6±1,15                                           |                                                  |
| **Stature (m)**                                 | 1,713±8                                         | 1,71                                             | 1,70                                             | 1,7145                                           |
| **±0,068**                                      | 5558                                            | 82±0                                             | 82±0                                             | ±0,046                                           |

LMA: Injury spinal asset; LMS: Injury spinal sedentary, CA: Active Control; CS: Sedentary Control; MCT: Total body mass, BMI: Body mass index. (* p<0,05).

In the average age, total body mass and height of the groups there was no statistically significant differences. The value adopted was of p≤0,05.

This study was conducted with people with spinal cord injury, philanthropic institutions of the Federal District, Brazil after the approval of the Ethics Committee on Human Research of the Faculty of Health Sciences, University of Brasilia, under the registration number 188/2008. People who participated in the study signed a consent form.

Samples were collected at the University Hospital of Brasilia (HUB) in a single moment. The exclusion criteria were:

1. have some fixed body segment in the last six months prior to the assessment.
2. were making use of medications that interfere with bone metabolism
3. illness that interferes with bone metabolism
4. not in physical or physiological condition that prevented it to be transported to the site of the exams
5. have scabs on the body
6. have any metallic objects in the body that interferes with bone mineral density
7. inability to correct position on the equipment to perform bone densitometry

The variables were presented descriptively as means and standard deviations and to ensure normality and homogeneity of variance test was used Levene's test, parametric one-way ANOVA to compare differences between the experimental and control groups and, where difference was found, we used the post-hoc Tukey test for variables whose variances were equally distributed and the post-hoc Games-Howell for variables whose variances were not equally distributed. Data analysis was performed using SPSS for Windows, version 16.0 and the level of significance was p≤0.05.

RESULTS AND DISCUSSION

The average, standard deviations of bone mineral density of the femoral colon and lumbar spine L1-L4 are presented in the table in Table 2.

<table>
<thead>
<tr>
<th>DMO CF (g/cm²)</th>
<th>LMA</th>
<th>LMS</th>
<th>CA</th>
<th>CS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMD L1-L4(g/cm²)</td>
<td>0,808 ± 0,117</td>
<td>0,760 ± 0,189</td>
<td>1,103 ± 0,213</td>
<td>1,109 ± 0,156</td>
</tr>
<tr>
<td></td>
<td>1,114 ± 0,148</td>
<td>1,196 ± 0,178</td>
<td>1,184 ± 0,137</td>
<td>1,232 ± 0,136</td>
</tr>
</tbody>
</table>


The bone mineral density of the lumbar spine (L1-L4) and of the femur (femoral colon and trochanter) was measured by a unit of X-ray absorptiometry (DXA), a GE model DPX-NT (Software version EMCORE 2005 GE Healthcare, version 9.1). The DXA is the most accurate method, and with low radiological exposure. The bone measurement in this study was done by DXA, because it was considered a standard technique due to its accuracy, duration, safety and cost.

In this study there was a higher percentage of people with paraplegia (LMA = 87.5% and LMS = 70%) and complete spinal cord injury (LMA = 56,25% and LMS 70%), all of which were from traumatic origin, data that corroborate with several studies of people with spinal cord injuries extended through the sacral segments S4-S5, without motor function preserved below the neurological level and 18,75% lesion C (motor function preserved below the neurological level, most of the key muscles below the neurological level have a muscle grade less than 3). From the LMS 70% have lesion A and 30% B. The evaluation of these levels were classified by the ASIA scale.

Motor vehicle accidents were the leading cause of spinal cord injury in the experimental group who practiced physical activity (43,75%), followed by firearm injuries (18,75%) and other causes (37,5%), similar to the study of Bampi et al., (2008) and people hospitalized at Sarah Network of Hospitals of Rehabilitation. In the experimental group of sedentary, injury by firearms was the most common cause of spinal cord injury (70%), followed by motor vehicle accidents (20%) and other causes (10%), similar data to another study. note that these last three cited studies did not describe the level of physical activity of the study participants.

Physical activities performed in this study for people with spinal cord injuries assets (LMA) were in wheelchair basketball, athletics, tennis court and table, swimming, archery and cycle ergometer upper and active group control (CA) swimming, weight training, running, walking, jumping, and gymnastics located. The group performed at least 1 hour of physical activity daily, minimum 2 and maximum 5 times per week.

There was a reduction of 13 individuals for the analysis of BMD L1-L4, because some lumbar column become unable to analyze (some projectile metal rod and some very sharp deviation in the column that would prevent the realization of these analyzes).

Differences were statistically significant (p≤0.05) in the variables body mass index (BMI) (Table 3).
This significant difference in spinal cord injured sedentary can compromise them, since, according to one study, 20 thin men, of low stature and BMI have lower BMD and increased risk of osteoporosis.

The lumbar spine L1-L4 had no statistically significant difference between the experimental and control groups, data that some studies.21-22 This may have occurred because the sample was chosen for convenience, which was representative only the same.24

In BMD of the femoral colon were statistically significant differences between the means of the groups (Table 4).

Table 3. Significance between the average groups - body mass index.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Differences in averages</th>
<th>Standard Error</th>
<th>p value</th>
<th>Confidence interval 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower limit</td>
</tr>
<tr>
<td>LMA</td>
<td>-3.8024*</td>
<td>1.2743</td>
<td>0.022</td>
<td>-7.191</td>
</tr>
<tr>
<td>CA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LMS</td>
<td>-4.1059*</td>
<td>1.4300</td>
<td>0.030</td>
<td>-7.909</td>
</tr>
<tr>
<td>CS</td>
<td>3.8024</td>
<td>1.2743</td>
<td>0.022</td>
<td>0.413</td>
</tr>
<tr>
<td>LMS</td>
<td>4.1059</td>
<td>1.4300</td>
<td>0.030</td>
<td>0.303</td>
</tr>
</tbody>
</table>

LMA: Injury spinal asset; LMS: Injury spinal sedentary, CA: Active Control; CS: Sedentary control, (* p≤0,05)

There was no significant difference in femoral neck between the active and sedentary groups, but the mean BMD of the experimental group is lower than the control group, data corroborate several studies.21-25

Many sports presented in this study did not interfere with the BMD of people with spinal cord injury, since different intensities of exercise did not differ the BMD in this population.26

It was not measured spasticity of spinal cord injured people in the present study since the degree of spasticity does not interfere significantly in bone mineral density in this population.22,26,27

There was no significant difference in bone mineral density in this population, with the same spinal cord injury etiology, level and time since injury and motor impairment, and a greater number of individuals to better homogenize the sample.

Physical activity has an important role in the quality of life of people with spinal cord injury, something that should be inserted in the routine of life in this population, to have beneficial reflections on health as a whole.

Table 4. Significance between the groups average - Bone mineral density of the femoral colon.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Differences in averages</th>
<th>Standard Error</th>
<th>p value</th>
<th>Confidence interval 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower limit</td>
</tr>
<tr>
<td>LMA</td>
<td>-0.295062</td>
<td>0.060453</td>
<td>0.000</td>
<td>-0.4583</td>
</tr>
<tr>
<td>CA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LMS</td>
<td>-0.301262</td>
<td>0.069963</td>
<td>0.000</td>
<td>-0.4873</td>
</tr>
<tr>
<td>CS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LMA</td>
<td>0.295062*</td>
<td>0.060453</td>
<td>0.000</td>
<td>0.13429</td>
</tr>
<tr>
<td>CA</td>
<td>0.301262*</td>
<td>0.069963</td>
<td>0.000</td>
<td>0.11520</td>
</tr>
<tr>
<td>CS</td>
<td>0.341900*</td>
<td>0.077617</td>
<td>0.000</td>
<td>0.14268</td>
</tr>
</tbody>
</table>

LMA: Injury spinal asset; LMS: Injury spinal sedentary, CA: Active Control; CS: Sedentary control, (* p≤0,05)

CONCLUSION

The L1-L4 BMD did not differ significantly among the four groups. The BMD of the femoral neck is significantly lower in people with spinal cord injury compared with control groups. This shows that these people have a higher risk of fractures of the lower limbs, which in turn affects the quality of life of this population. There is no significant difference in BMD of the femoral neck among people with SCI active and sedentary, but it is known that physical activity interferes positively improving mobility and performance of activities of daily living of people with spinal cord injury.

Given the different characteristics of people with spinal cord injury, we suggest further studies with bone mineral density and quality of life, with the same spinal cord injury etiology, level and time since injury and motor impairment, and a greater number of individuals to better homogenize the sample.

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