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Original contribution

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Relationship between atherosclerotic disease and disc herniation in patients with integral conservative management

Relación entre la enfermedad aterosclerótica y hernia discal en pacientes con manejo conservador integral

Abstract

Introduction: Atherosclerosis is the leading cause of general mortality and hospital morbidity. The prevalence of lumbar intervertebral disc degeneration related to atherothrombotic pathology has been increasing, and the incidence of low back pain reaches its peak after 45 years. A relationship between the decrease in apolipoprotein A1 and hypertriglyceridemia as related factors, as well as hypertension, elevated LDL levels and a high Framingham score, but it has yet to be seen if the treatment is compromised in that aspect.

Methods: Retrospective observational study in patients with herniated disc treated with combined conservative therapy, comparing their effectiveness depending on the cardiovascular risk presented.

Results: A total of 171 patients were analyzed. 25.7% presented adequate weight, 41.5% overweight and 32.8%, obesity. In all, 42.7% had hypertension, 19.3% diabetes mellitus, 15.3% smoked, no patients had physical activity and 24% had a high or very high cardiovascular risk. There was no difference between the results presented with the combined conservative treatment.

Conclusion: In addition to the physical components that cause disc herniation, there is a compromised circulatory component, which was not affected after the combined conservative treatment, which is why it is recommended the timely treatment of the herniated disk and its risk factors.

Keywords

atherosclerosis, herniated disk, conservative treatment.

Resumen

Introducción: La aterosclerosis constituye la primera causa de mortalidad general y morbilidad hospitalaria. La prevalencia de la degeneración del disco intervertebral lumbar relacionada a la patología aterotrombótica ha ido creciendo, y la incidencia de dolor lumbar alcanza su pico después de los 45 años. Se ha encontrado una relación entre la disminución de la apolipoproteína A1 y la hipertrigliceridemia como factores relacionados, así como la hipertensión, niveles elevados de LDL y un puntaje elevado en el Score Framingham, pero no se ha visto si el tratamiento está comprometido en ese aspecto.

Métodos: Estudio observacional retrospectivo en pacientes con hernia discal tratados con terapia conservadora combinada, comparando su efectividad dependiendo del riesgo cardiovascular que presentaran.

Resultados: Un total de 171 pacientes fueron analizados. 25.7% presentaban peso adecuado, 41.5% sobrepeso y 32.8%, obesidad. Un 42.7% tenían hipertensión arterial, 19.3% diabetes mellitus, 15.3% tabaquismo, ningún paciente realizaba actividad física y 24% tuvieron un riesgo cardiovascular alto o muy alto. No hubo diferencia entre los resultados presentados con el tratamiento conservador combinado.

Conclusión: Además de los componentes físicos que causan hernia discal, se aprecia un componente circulatorio comprometido, el cual no se vio afectado tras el tratamiento conservador combinado, por lo que se recomienda el tratamiento oportuno de la patología y de los factores de riesgo.

Palabras clave

aterosclerosis, hernia discal, tratamiento conservador.

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Introduction

Atherosclerosis is the leading cause of general mortality and hospital morbidity. It is a disease of the metabolism that responds to the persistent aggression and exponential intensity that affects the connective tissue of the arterial wall, in which a series of physical, hemodynamic, biochemical, metabolic, humoral, inflammatory, and coagulation alterations finally end up damaging the arterial wall with a scar, which is the atherosclerotic lesion.¹

Since this ischemic injury is capable of causing pain and degeneration of the structures involved, atherothrombotic disease of the arteries that irrigate the spine has received increased consideration as one of the possible underlying factors for both lower back pain and herniated discs. Atheromatous plaques begin to appear in the abdominal aorta in adulthood, and 20 years later, 10% of the population in developed countries will have advanced lesions in the abdominal aorta. The prevalence of lumbar intervertebral disc degeneration (IDD) related to atherothrombotic pathology has been increasing steadily in early adulthood, and the incidence of lumbar pain (LP) increases linearly to reach its highest prevalence after the age of 45. Although IDD and LP are fairly common, one can develop without the other.

The most rapid increase in the number of complications (necrosis, ulcerations, thrombi, calcifications) occurs between the ages of 44-64 years old.^{2,3} These lesions tend to accumulate at the bifurcation and around the orifices of the branched arteries. The lumbar spine, supplied by these branched arteries, may be affected if the arteries become clogged. The segmental lumbar arteries supply the first to the fourth lumbar segments. The fifth lumbar segment is supplied by branches of the middle sacra, and by tributaries of the iliolumbar arteries. In addition to the lumbar vertebrae, these arteries also irrigate surrounding structures such as intervertebral discs, nerve roots, and paraspinal muscles. The spinal cord is less dependent on these arteries because its main supply of blood does not come from the lumbar

spine.⁴ In contrast, the intervertebral disc,⁵ as the largest avascular structure in the body, relies on the passive diffusion of the peripheral arteries for nourishment. Therefore, the disc may be a risk zone for anyone with atherosclerotic disease. Computed tomography angiography (CTA) offers better spatial resolution to visualize the atherosclerotic narrowing of small arteries, such as the lumbar artery.

After the preliminary findings of a necropsy study in 1993,^{5,6} suggesting an association between decreased blood supply to the lumbar spine and lower back pain, atherosclerosis and cardiovascular risk factors have received increased consideration as possible underlying factors for back disorders.

Lifestyle factors, such as smoking or diet, may play a significant role in spinal problems as they promote vascular disease and play an underlying role in degenerative changes and pain.

Other cardiovascular risk factors have been studied concerning lumbar intervertebral disc degeneration and lower back pain's relationship with atherosclerosis. Hemingway⁷ found a considerable decrease in Apolipoprotein A1 (Apo 1, the major protein component of high-density lipoproteins (HDL) which is responsible for the activation of the lecithin-cholesterol acyltransferase (LCAT) which binds to the HDL receptor to stimulate inverse cholesterol transport and to intervene in the structure) in a sample of 4,886 office workers between 35 and 55 years old, in both genders; and in men an important hypertriglyceridemia associated with incapacity for work due to a disease secondary to back pain. Leino-Arjas⁸⁻¹⁰ found an association between elevated triglycerides and lower back pain in three separate studies.

In addition, high blood pressure, high cholesterol, elevated LDL, and increased carotid intima and middle layers have been found to be significantly associated with lower back pain.

An increase in the investigation of modifiable and non-modifiable risk factors in patients

with cardiovascular risk leads to a reduction in morbidity and mortality. This risk assessment uses the Framingham model, tables, and SCORE, which can easily be adapted to the conditions, resources, and priorities of different countries, and take into account the heterogeneity in cardiovascular disease mortality, as can be seen in [Figure 1](#).¹¹

In an effort to seek a more rapid and effective recovery for patients, the combined conservative strategies achieve an accelerated recovery of patients in a more effective and less invasive way (through anti-inflammatory drugs, ozone therapy, and targeted rehabilitation),¹²⁻¹⁵ leaving surgery as a last resort and obtaining good results in the majority of patients with herniated disc.

Due to the tendency for combined conservative treatment of the herniated disc and to the relationship of the disease with vascular diseases, it was decided to seek a relationship between both and to seek benefits through conservative combined treatment of disc herniation.

Material and methods

A retrospective observational study was performed in patients with herniated disc undergoing conservative combined treatment at the Spine Center in 2015, with the objective of comparing the effectiveness of the technique used in different groups of patients depending on cardiovascular risk and presented comorbidities.

Inclusion criteria were: 18-65 years old patients with clinical and imaging diagnosis of herniated disc, who completed a minimum of 15 sessions of combined treatment of parenteral therapy, rehabilitation, and ozone therapy in the Spine Center. Additionally, they duly signed an informed consent to an anonymous review of their progress with this therapeutic modality.

Patients outside this age range or with a different

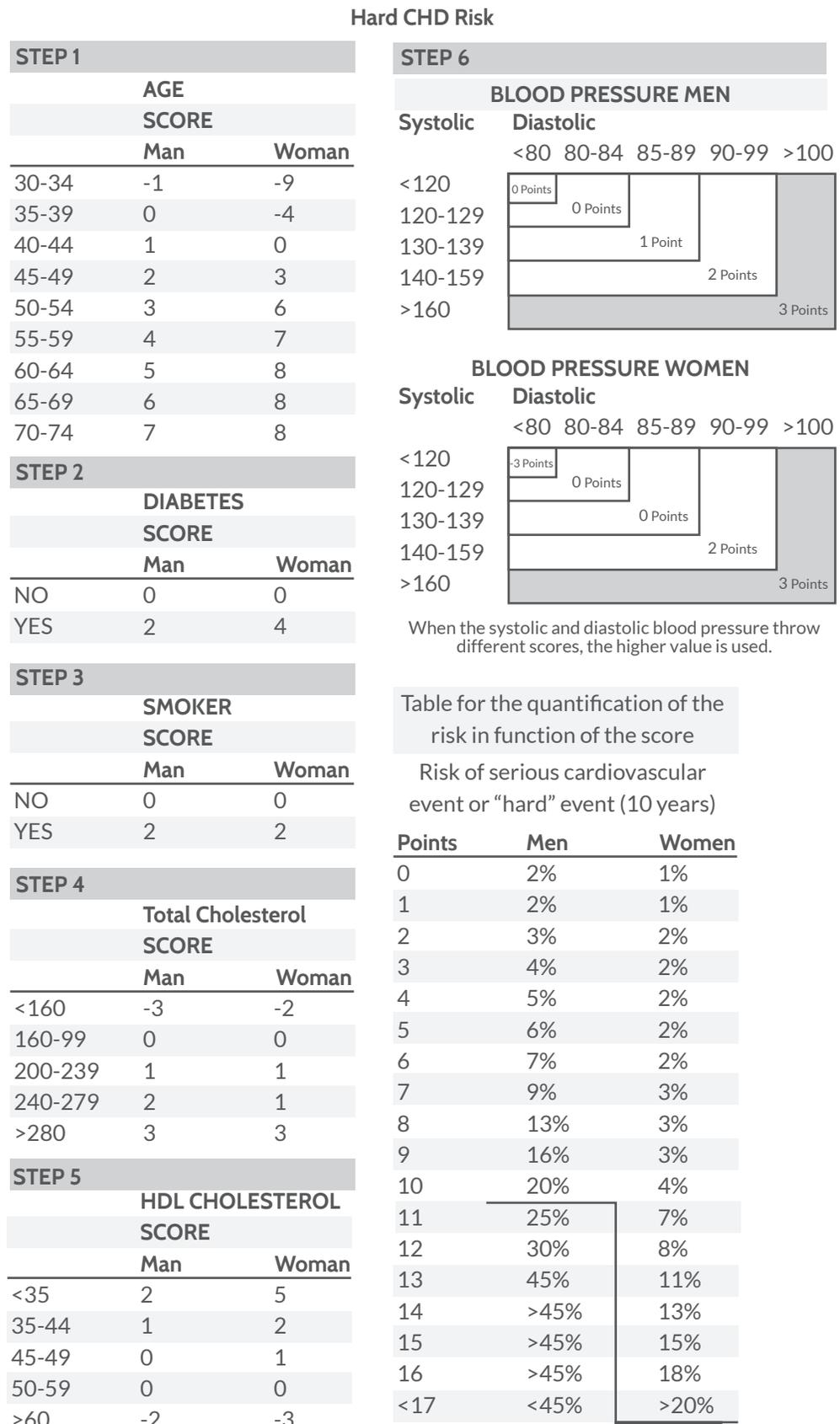
diagnosis were excluded, as well as patients who did not complete the 15 combination treatment induction sessions or who have been inconstant, patients who presented an inconvenience or an adverse event in their treatment or in their condition, patients with incomplete records or who did not authorize the review of their clinical file through the informed consent. Response variables were assessed after administration of 15 sessions of conservative combined treatment using a visual analogue scale for pain (VAS; 0 = no pain and 10 = most severe pain) and the search for a relationship between weight, body mass index (BMI), and risk of cardiovascular event related to the present symptomatology.

All patients were standardized in each session with intravenous medications (analgesics, anti-inflammatories, multivitamins and homotoxicology), ozone therapy and physical therapy sessions (electrotherapy, local ultrasound, massage therapy, thermotherapy, hydrotherapy, traction, Williams exercises, and neuromuscular bandaging).

Ethical considerations

The study was conducted in accordance with the principles of the 1989 Declaration of Helsinki, with all its modifications, and under the norms and guidelines of Mexico's General Health Law. As this was a retrospective observational study, it did not require a review by the Institution's Ethics Committee. All the patients gave their informed consent duly signed.

Figure 1.
Cardiovascular risk using
Framingham Score.¹¹



Results

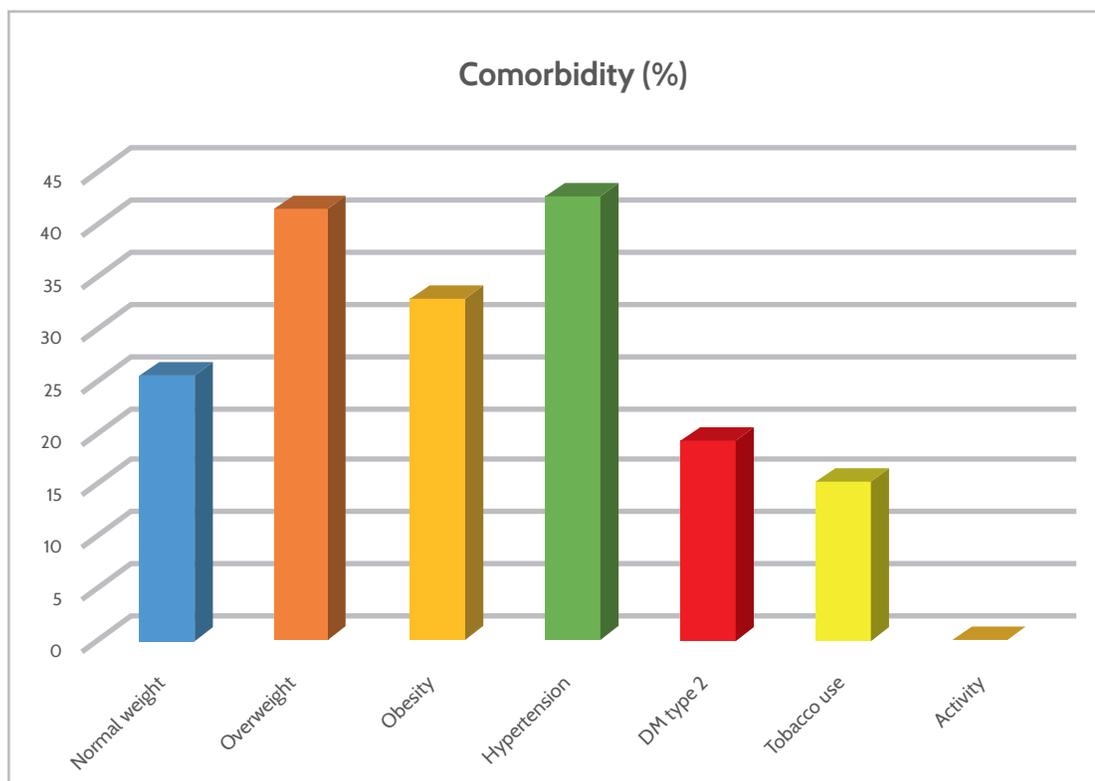
Out of 593 patients treated in 2015, 171 met the inclusion criteria. The average age of the patients was 59.7 ± 13.7 years, their weight 75.7 ± 15.9 kg, the pain (measured by VAS) at the beginning was 7.3 ± 1.9 , and 2.4 ± 2 at the end, and there was no discernible difference related to the risk factors. Cholesterol levels were 193.4 ± 40.8 , LDL levels of 116.2 ± 81.8 , HDL levels of 52.4 ± 13 , and the average risk of cardiovascular event was 14.8 ± 13.3 .

Out of the 171 patients, 25.7% presented an

adequate weight, 41.5% were overweight, and the remaining 32.8% had some degree of obesity (22.2% obesity type I, 5.8% obesity type II and 4.7% obesity type III). It should be mentioned that 42.7% of the patients suffered arterial hypertension, 19.3% had diabetes mellitus, 15.3% used tobacco, no patient performed any physical activity prior to the radiculopathy, and 24% presented a high or very high cardiovascular risk (Framingham score >20). These results are better illustrated in [Figure 2](#).

Figure 2. Comorbidities in the study group.

DM: diabetes mellitus.



Discussion

It is increasingly common to hear the term “herniated disc” and the increase in the incidence of cases with this pathology is alarming because the onset of symptoms is occurring at an earlier age and the patient seeks treatment until the disease worsens, which makes its handling much more complicated.

Simultaneously, atherosclerosis has become one of the great epidemics of the 21st century. Twenty-five years ago, when the International Conference on Primary Care was held by the World Health Organization (WHO), a list of eight essential elements was drawn up, where no reference was made to the treatment or prevention of conditions such as heart disease or stroke. At the time, cardiovascular diseases and other non-communicable diseases were considered characteristic of industrialized countries (in fact, they were called “diseases of the rich”) were attributable to ways of life radically different from those prevailing in most parts of Africa, Asia and many other places of the developing world, but the reality is quite different: cardiovascular diseases have not only appeared in practically all countries but have also spread remarkably; this increasing burden poses a real threat of hindering social and economic development. Risk factors serve as indicators of future health status, and five out of ten of the main global threats are related to non-communicable diseases such as arterial hypertension, tobacco use, alcohol use, hypercholesterolemia, obesity, or overweight.¹⁶

Results show there is a correlation between atherosclerosis, metabolic syndrome, and

microcirculation ailments such as herniated discs. The fact that more prevalence of arterial hypertension has been observed (42.7%) than that of diabetes mellitus (19.3%), and the fact that the patients respond to intravenous treatment indicates that the circulation of the intervertebral disc can be more compromised by atherosclerosis than by ischemia (without ruling out the latter), but more circulation studies have to be done to confirm it and to be able to regulate approaches to future treatments.

Conclusion

It can be observed that the herniated disc, in addition to the physical factors that cause it, has an important circulatory component, which was not so affected when comparing the results after the combined conservative treatment. Adequate recognition of symptoms caused by disc herniation, together with a correct diagnosis, timely treatment, and control of comorbidities, is indispensable for a favorable prognosis; therefore, a timely and adequate diagnosis and comprehensive treatment of the patient's condition and its underlying circulatory diseases, is highly recommended.

Conflict of interest statement

The authors of this manuscript declare no conflict of interest with the subjects mentioned here.

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