

# Atherosclerosis and Disc Degeneration: A Cross-Sectional Study

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## Abstract

**Introduction:** Lumbar disc degeneration is a common and important condition. Although many factors have been suggested in association with this problem, researchers are trying to find newer, more preventable etiologies. This study aims to investigate an association between aortic diameter and lumbar disc degeneration at L4-L5.

**Methods:** Magnetic resonance (MR) images of 50 patients with lumbar disc degeneration at L4-L5 (case group) and 50 well-matched patients without such changes (control group) were enrolled in a retrospective study. The diameter of the abdominal aorta was measured and compared between the two groups of patients.

**Results:** There were 25 males and 25 females in each group. The mean age of the patients in the case group was  $64.43 \pm 11.23$  years vs.  $62.12 \pm 10.134$  years in the control group ( $P = 0.60$ ). The mean diameter of the abdominal aorta was significantly higher in the case than in the control group ( $20.43 \pm 12.23$  mm vs.  $16.12 \pm 8.89$  mm;  $P = 0.04$ ).

**Conclusions:** Atherosclerotic changes in the abdominal aorta may be connected with degenerative changes at the L4-L5.

## INTRODUCTION

Disc degeneration is a very common disease all over the world. In addition to its high prevalence, disc degeneration may be accompanied with significant clinical consequences such as intervertebral disc hernia and canal stenosis [1-4]. Many factors have been proposed in association with disc degeneration such as aging, various environmental factors, hereditary causes, occupation and life style [5-9]. An important but less concentrated on factor in this regard is the atherosclerotic changes in the abdominal aorta. This is important because the blood supply of the lumbar vertebral segment is from the abdominal aorta and atherosclerotic changes may have an adverse effect on it [10, 11]. Indeed, some studies have suggested that the patients with lumbar disc degenerative changes have higher rates of atherosclerotic changes in their abdominal aorta, but the studied variables as indicators of atherosclerotic changes have been unreliable [12, 13]. In this study we aimed to examine a possible connection between abdominal aortic diameter, as an indicator of atherosclerosis, and lumbar disc degeneration at L4-L5.

## METHODS

A total of 50 MR images of patients with lumbar disc degeneration at L4-L5 (case group) and 50 MR images of participants with normal lumbar discs at L4-L5 (control group)

were retrospectively reviewed between 2015 and 2016. Patients with anatomical abnormalities and/or previous surgery in the lumbar region were not included. The ethics committee of our university approved the protocol of this study. To eliminate possible effects of confounding factors the two groups were selected matched in terms of age, sex, body mass index (BMI) and lipid profile abnormalities (hypertriglyceridemia and/or hypercholesterolemia).

An experienced attending radiologist was asked to review all MR images and report the diameter of the abdominal aorta right below the branching site of the right renal artery. To achieve this aim the internal diameter of the aorta was measured under 2X magnification using a caliper accessible through the dedicated MR software on relevant axial MR images. Of note, the radiologist was blind to the groupings.

Finally, the mean measured aortic diameters were compared between patients with and without lumbar disc degeneration at L4-L5.

## Statistics

The SPSS software version 16 (SPSS, USA) was used for statistical analysis. The Chi-square test and the independent samples *t* test were used for comparisons. The Pearson

Variable	Case (n = 50)	Control (n = 50)	P value
Sex (male)	25 (50)	25 (50)	-
Age (y)	64.43 ± 11.23	62.12 ± 10.134	0.60
Body mass index (kg/m <sup>2</sup> )	26.12 ± 2.01	26.09 ± 3.12	0.78
Lipid profile abnormality	14 (28)	16 (32)	0.43

Numeric data are shown as mean ± standard deviation and No (%).

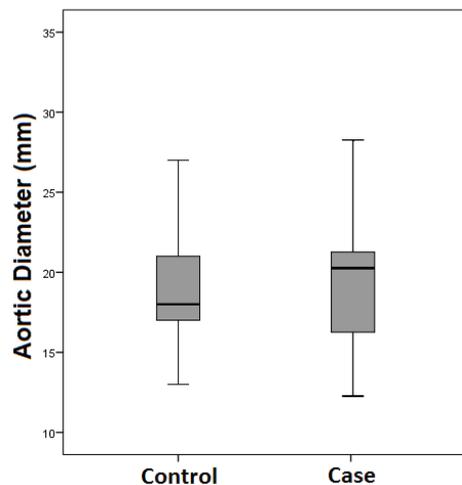
coefficient (*r*) was used to test correlations between numeric variables. A P-value < 0.05 was considered statistically significant.

## RESULTS

General data of the participants in two case and control groups are summarized and compared with each other in Table 1. Accordingly, the two groups were comparable in terms of sex, age (P = 0.60), BMI (P = 0.78) and lipid profile abnormalities (P = 0.43).

The mean diameter of the abdominal diameter was significantly higher in the case than in the control group (20.43 ± 12.23 mm vs. 16.12 ± 8.89 mm; P = 0.04) (Fig 1).

In the case group there were significant correlations between the aortic diameter with both age (*r* = 0.45, P = 0.03) and BMI (*r* = 0.51, P = 0.04).



**Figure 1:** The Mean Diameter of the Abdominal Aorta in Patients With and Without Lumbar Disc Degeneration at L4-L5

## DISCUSSION

In our study the mean diameter of the abdominal aorta was significantly higher in patients with lumbar disc degeneration at L4-L5 compared to that in a well-matched group of patients without lumbar disc pathologies. Similarly, previous studies have shown that there might be connection between atherosclerotic changes in the aorta and degeneration in the lumbar vertebrae. For example, in a study by Kauppila and Tallroth [14] a connection was reported between the ischemia of the lumbar vertebrae and their degenerative changes. In another series, in line with our finding, Kauppila et al [15] concluded that the degree of calcification in the abdominal

aorta, which is a good indicator of atherosclerotic changes, is associated with the presence and severity of lumbar disc degenerative changes. Similar report is also available in the literature by Turgut et al [16]. They also found a significant association between aortic atherosclerotic changes (i.e. calcification) and the presence of lumbar disc degeneration.

According to some other reports, however, the calcification might not be a good indicator of atherosclerotic changes of the aorta when its association with lumbar disc degeneration needs to be tested, because they may share a common pathologic pathway [17-20]. So, in the present study we decided to use another good marker of aortic atherosclerotic changes, i.e. its diameter. We think that this is the first report in the literature that tries to connect this finding with lumbar disc degeneration and interestingly, a significant association was detected.

To explain this significant connection the normal blood supply of the lumbar vertebrae should be considered. Accordingly, in normal conditions the vessels irrigating the lumbar discs originate from the abdominal aorta. Even in nonsclerotic conditions these vessels are not considered high-pressure blood conduits. So, when this already impaired condition is interrupted, for example in case of aortic dilation, the previously impaired blood supply encounters failure and hence, the blood supply to the vertebrae and the corresponding discs are compromised. These changes may lead to degeneration in the target tissues. This could justify the finding that a more dilated abdominal aorta is more frequent among patients with degenerative changes in the lumbar vertebrae [21].

Despite this significant finding, this study bears a limitation in design that it is its retrospective and cross-sectional fashion. So, it is suggested that such a connection between atherosclerotic changes in the abdominal aorta needs to be investigated in future longitudinal series.

In conclusion atherosclerotic changes in the abdominal aorta may be connected with degenerative changes in the lumbar vertebral disc at L4-L5.

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