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REVIEW

# Atherosclerosis and Disc Degeneration/Low-Back Pain — A Systematic Review

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**KEYWORDS**
Aortic calcification;
Lumbar arteries;
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Lipids;
Cholesterol

**Abstract** *Objectives:* Atherosclerosis can obstruct branching arteries of the abdominal aorta, including four paired lumbar arteries and the middle sacral artery that feed the lumbar spine. The diminished blood flow could result in various back problems. The aim of this systematic literature review was to assess associations between atherosclerosis and disc degeneration (DD) or low-back pain (LBP).
*Data sources:* A systematic search of the Medline/PubMed database for all original articles on atherosclerosis and DD/LBP published until October 2008. The search was performed with the medical subject headings atherosclerosis, cardiovascular risk factor, or vascular disease and keywords ''disc degeneration'', ''disc herniation'', and ''back pain'' on the basis of MeSH tree and as a text search. In addition reference lists were studied and searched manually. Observational studies investigating the association of atherosclerosis or its risk factors and lumbar DD/LBP were selected.
*Review methods:* The following data were extracted: study characteristics, duration of follow-up, year of publication, findings of atherosclerosis/cardiovascular risk factors and DD/LBP. Disc herniation was regarded as a form of disc degeneration and cardiovascular risk factors were regarded as surrogate for atherosclerosis in epidemiological studies.
*Results:* One hundred and seventy-nine papers were identified. After exclusion of case reports, letters, editorials, papers not related to the lumbar spine, and animal studies, 25 papers were included. Post-mortem studies showed an association between atheromatous lesions in the aorta and DD, as well as between occluded lumbar arteries and life-time LBP. In clinical studies, aortic calcification was associated with LBP, and stenosis of lumbar arteries was associated with both DD and LBP. In epidemiological studies, smoking and high serum cholesterol levels were found to have the most consistent associations with DD and LBP.

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*Conclusion:* Aortic atherosclerosis and stenosis of the feeding arteries of the lumbar spine were associated with DD and LBP. Cardiovascular risk factors had weaker associations, being clearly apparent only in cohorts on elderly people or in large study samples. More prospective clinical studies are needed to further clarify the association of atherosclerosis and low-back disorders.


## Introduction

Back problems are the second leading cause of disability and the leading cause of job-related disability.[1] The prevalence of lumbar intervertebral disc degeneration (DD) grows steadily from early adulthood onwards, and the incidence of low-back pain (LBP) increases linearly to reach its highest prevalence after the age of 45 years.[2–4] Though both DD and LBP are fairly common, they are only weakly connected to each other.[4] DD may develop without LBP symptoms, or a patient may have considerable LBP without radiologically observable DD. Since ischemia is capable of causing both pain and degeneration of the involved structures, atherothrombotic disease of the feeding arteries of the lumbar spine has received growing attention as one of the possible underlying factors for both LBP and DD.

Atheromatous plaques begin to appear in the abdominal aorta early in adult life, and by the age of 20 years roughly 10% of the population in the developed countries already has advanced lesions (i.e. fibrous plaques) in the abdominal aorta (Fig. 1). The most rapid increase in the amount of complicated lesions (i.e. plaques with necrosis, ulcerations, thrombi, calcification) occurs between 44 and 64 years of age.[5,6] These lesions tend to build up in the bifurcation and around orifices of branching arteries. The lumbar spine, which is supplied by these branching arteries, can suffer if the arteries become obstructed. Segmental lumbar arteries, originating from the posterior wall of the abdominal aorta, supply the first through the fourth lumbar segments. The fifth lumbar segment is supplied by branches of the middle sacral artery, which originates in the aortic bifurcation, and also by tributaries of the iliolumbar arteries branching from the internal iliac arteries.[7–9] In addition to lumbar vertebrae, these arteries also supply surrounding structures such as intervertebral discs, nerve roots, and paraspinal muscles (Fig. 2). The spinal cord is less dependent on these arteries because its main blood supply comes from above the lumbar spine.[7,9]

After preliminary findings from a necropsy study in 1993, suggesting an association between diminished blood supply of the lumbar spine and LBP,[10] atherosclerosis and cardiovascular risk factors have received growing attention as one of the possible underlying factors for back disorders. The aim of this review was to examine the associations between atherosclerosis/its risk factors and DD/LBP, and to discuss possible mechanisms for observed associations.

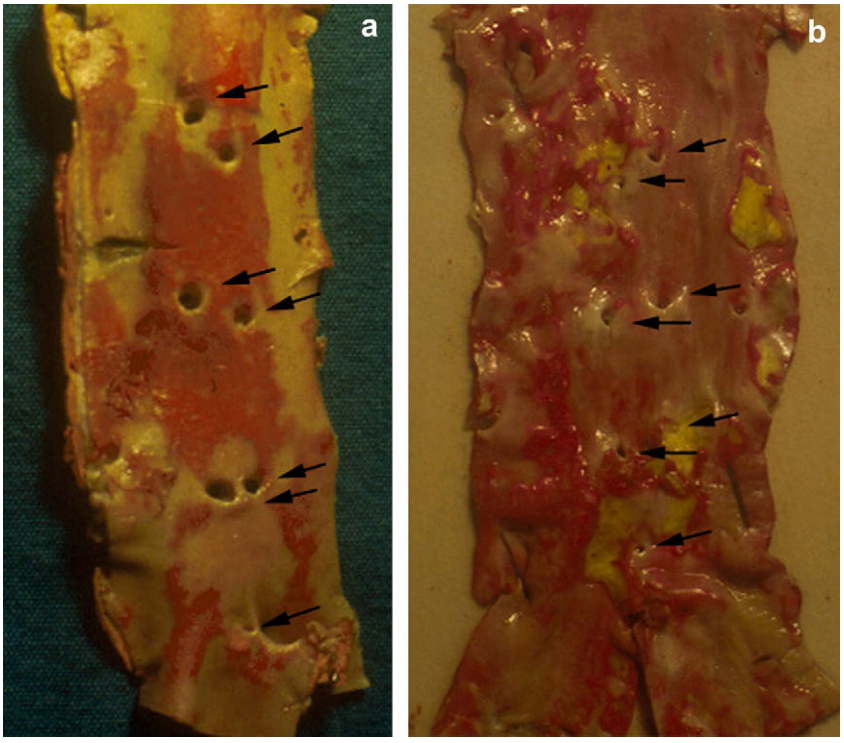


**Figure 1** a. Well-preserved orifices of the 2nd—4th lumbar arteries and the middle sacral artery (lowest orifice) in the posterior wall of the abdominal aorta. Red staining shows fatty streaks. b. Several stenotic orifices of the lumbar arteries.