Links between intervertebral disc degeneration and osteoarthritis

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Pressures in the disc vary with posture

Disc pressure when lying down is about 2 atmospheres (pressure in a car tyre)

Disc pressures can rise to 20 times this level under some activities

(Nachemson et al, 1966)
Pressures in the disc arise mainly from muscular activity rather than body weight.

Pressure rises >2 atmospheres on sneezing

Wilke et al, 1999
Schematic view of collagen network organisation with scanning EMs of nucleus and annulus
(adapted from Inoue and Takeda, 1975)
Disc cells make and maintain the matrix

**Nucleus Cells**
- Rounded ‘chondrocyte-like cells

**Organised collagen lamellae**

**Outer Annulus Cells**
- Long, thin, extended cells

Fine loose collagen network
Gross morphology of the disc alters in many different ways

(H.J. Wilke)

<table>
<thead>
<tr>
<th>Grade 0</th>
<th>Grade I</th>
<th>Grade II</th>
<th>Grade III</th>
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<tbody>
<tr>
<td>(no degeneration)</td>
<td>(mild degeneration)</td>
<td>(moderate degeneration)</td>
<td>(severe degeneration)</td>
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<tr>
<td>Height Loss</td>
<td>Fissures</td>
<td>Delamination</td>
<td>Clefts</td>
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<td>Fibrotic tissue</td>
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<td>Sclerosis</td>
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<td>Osteophytes</td>
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</table>
MMP concentrations and activities increase in Degenerate Discs

Grades of Degeneration

Thompson et al, 1990

(Crean et al, 1998)

Le Maitre et al, 2007
This paper finds that in the population examined, people with a higher degree of degeneration are more likely to have had low back pain.
Degenerate discs lose their blood supply

• The disc has no blood vessels
• In degenerate discs, blood supply to the disc may be blocked
• Cells may starve, become less active and even die.

Crock and Yoshizawa 1977

Benneker et al, 2005