

DISCOGENIC PAIN - A diagnostic challenge

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien vid Göteborgs universitet kommer att offentligens försvaras i Arvid Carlssons hörsal, Academicum, Medicinaregatan 3, Göteborg, fredagen den 21 februari 2014, klockan 09.00 av

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Leg. läkare

Fakultetsopponent:

Docent Acke Ohlin

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The thesis is based on the following studies:

- Study I **The transfer of disc pressure to adjacent discs in discography. A specificity problem?** Hebelka H, Gaulitz A, Nilsson A, Holm S, Hansson T
Spine 2010,35(20):E1025-9
- Study II **In vivo discography in degenerated porcine spines revealed pressure transfer to adjacent discs.**
Hebelka H, Nilsson A, Ekström L and Hansson T
Spine 2013,38(25):E1575-82
- Study III **Pressure increase in adjacent discs during clinical discography questions the methods validity.**
Hebelka H, Nilsson A and Hansson T
Spine 2013 Dec. [Epub ahead of print]
- Study IV **HIZ's relation to axial load and low back pain: investigated with axial loaded MRI and pressure controlled discography.**
Hebelka H, Hansson T
European Spine Journal 2013,22(4):734-9
- Study V **Comparison between pain at discography and morphological disc changes at axial loaded MRI in patients with low back pain.**
Hebelka H, Brisby H and Hansson T
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DISCOGENIC PAIN - A diagnostic challenge

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Low back pain (LBP) is a common health complaint with a lifetime prevalence up to 80%. Patients with discogenic pain constitute a minority of all with LBP but represent an important group with substantial personal consequences and high demands on health-care and social systems. In spite of debated validity discography remains frequently used in the diagnosis of discogenic pain. A concordant pain provocation at discography is an indication of a painful disc. Discography is questioned, especially due to inconclusiveness regarding the rate of false positive responses. The primary aim of this thesis was to investigate a potential validity issue; whether a pressure increase is induced in adjacent discs during discography. Further it aimed to investigate the relationship between discography-induced pain and morphological disc changes, occurring during axial loaded MRI (aMRI) and if such axial load increase the detection of High Intensity Zones (HIZ). These aims were investigated in experimental in vivo studies and in clinical discography patients.

Study I-III: Discography was performed in nine healthy porcine lumbar spines (33 discs), in ten degenerated porcine spines (28 discs) and in nine patients (22 discs) with discogenic pain. During contrast injection disc pressure was recorded simultaneously in the injected and in one adjacent disc. All 33 adjacent discs in the healthy porcine spines displayed increased pressure of a mean of 16% (range 3-37) above baseline pressure. In the degenerated porcine spines 16 (57%) of the discs adjacent to the discograms revealed a pressure increase averaging 3 psi (range 2-8), corresponding to a mean increase above baseline of 11%. When including pressure reactions up to 15 minutes after injection increased pressure was recorded in 89% of the adjacent discs. In the clinical study 12 (55%) of the discs adjacent to the discograms displayed a pressure increase of a mean of 13 psi (range 3-42), corresponding to an increase of 62%. This induced pressure increase in adjacent discs (potentially inducing pain) constitutes a potential major source of false positive responses, questioning the validity of discography.

Study IV: 41 patients referred for discography underwent pressure controlled discography (PCD), CT, MRI and aMRI within 24 hours. 35 patients completed all MRI sequences (140 discs) and PCD was performed in 119 of the discs examined at MRI. The detection of HIZ was compared between conventional MRI and aMRI without significant differences. No significant correlation between HIZ and pain provoked at PCD was found. With PCD discogenic pain can neither be confirmed in discs with HIZ (PPV 39%) nor ruled out in discs without (NPV 76%). Quantification of HIZ at conventional and aMRI are needed to fully rule out any dynamic component of HIZ.

Study V: 41 patients referred for discography underwent PCD (119 discs), MRI and aMRI within 24 hours. Provoked pain at both discography and at aMRI was classified as concordant or discordant with daily pain as reference. Relationships between concordant pain at discography and morphological disc measures (degeneration, height, bulge, angle, area, and circumference) at MRI/aMRI were investigated. 98% of the patients experienced concordant pain at discography compared with 78% at the aMRI. No significant, clinically useful, differences between concordant and discordant discograms in terms of morphological MRI characteristics at either conventional MRI, aMRI or changes between these two were found. Alternative or more sensitive diagnostic methods are needed to understand the load-induced discogenic pain.

Conclusions: The validity of discography must be questioned due to induced pressure increase (potentially inducing pain) in adjacent discs. The detection of HIZ is not influenced by axial load. HIZ cannot be used as a reliable clinical predictor of painful discs. Loading of the spine, aMRI, revealed no specific clinically useful morphological characteristics in discs with concordant discograms.

Keywords: disc, disc pressure, low back pain, discography, axial loaded MRI, validity

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