

Smoking and Lumbar Disc Degeneration: A Case-Control Study among Iranian Men Referring to Lumbar MRI

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Abstract: Low back pain with a very high burden on health care systems, is one of the most common chief complaints of patients in family medicine. One of the leading causes of low back pain is disc degeneration. We designed this study to find any association between smoking and disc degeneration. As a case control study we compared pack years of smoking between patients with disk degeneration and patients without disc degeneration. By reviewing lumbar MRI of 500 patients who were referred to university MRI center we found 51 patients with disk degeneration based on Modic criteria. We restricted our study to male patients who hadn't history of shift work, drinking alcohol, diabetes, sedentary life style, trauma to low back and family history of low back pain. Also we controlled the effect of age by paired matching of cases and controls. Our sample dropped from 51 cases/controls to 31 cases/controls after controlling mentioned risk factors. Chi square test showed disk degeneration hadn't significant association with body mass index and having risky job. Logistic regression analysis showed that smoking 1 to 5 pack years (odds ratio= 5.87, 95% CI: 1.60-21.53) and also more than 5 pack year (odds ratio= 6.11, 95% CI: 1.52-24.66) are associated with increased risk of disk degeneration. Health education programs for prevention of low back pain may consider quitting cigarette smoking specially when there is co-morbidity between smoking and other major risk factors for arthrosclerosis.

Key words: Intervertebral disc, disc degeneration, smoking, magnetic resonance imaging

INTRODUCTION

Low back pain has a 70% life time prevalence (Frymoyer, 1998). One of the leading causes of low back pain is disc degeneration. In recent years, atherosclerosis has been suggested in the pathogenesis of lumbar disc degeneration (Kauppila *et al.*, 1994). Framingham study showed having aortic wall calcification at baseline predicts risk of degenerative changes in lumbar spines and reporting low back pain 25 years later (Kauppila *et al.*, 1997). Smoking is one of the major public health problem and a well known risk factor for atherosclerosis. Few studies shows smoking is a risk factor for disc degeneration but other studies don't confirm it.

There are few animal studies about the role of nicotine in the pathogenesis of disc degeneration. Two of them that was examined the effects of injected nicotine on intervertebral discs in rabbits showed nicotine injection caused necrosis and fibrous tissue and vitreous formation in the nucleus pulposus of the intervertebral disc (Uematsu and Matuzaki, 2001; Iwahashi and

Matsuzaki, 2002). Other studies showed tobacco smoke caused decomposition of chondrocyte activity in intervertebral disc by using a rat-smoking model (Oda and Matsuzaki, 2004; Ogawa and Matsuzaki, 2005).

Because of the controversy about association of smoking and disc degeneration and lack of any Iranian study about the possible role of smoking as a risk factor for disc degeneration, we designed this case control study.

MATERIALS AND METHODS

As a case control study we compared pack years of smoking between patients with disk degeneration with patients without disc degeneration. By reviewing lumbar MRI of 500 patients who were referred to university MRI center we found 51 patients with disk degeneration based on Modic criteria (Kuisma and Karpainen, 2006; Vlasuk, 2007).

Several risk factors have been suggested in the pathogenesis of disc degeneration (Leboeuf-Yade, 1999;

Table 1: Smoking, job, smoking data for cases and controls

	Cases (n = 31)	Controls (n = 31)	Chi square	p value
Smoking			10.91	0.004
> 5 pack years	10 (32.3)	4 (12.9)		
1 = pack years = 5	12 (38.7)	5 (16.1)		
Non-smoker	9 (29.0)	22 (71.0)		
Job			0.31	0.58
Risky job	10 (32.3)	8 (25.8)		
Safe job	21 (67.7)	23 (74.2)		
BMI			1.04	0.59
Obesity	6 (20.0)	6 (19.4)		
Over weight	9 (30.0)	13 (41.9)		
Normal	15 (50.0)	12 (38.7)		

Table 2: Logistic regression analysis predicting probability of disc degeneration

Variable	B	SE	Odds ratios	95% CI	P values
Non-smoker	Comparison group				
1 = pack years = 5	1.77	0.66	5.87	1.60-21.53	0.008
> 5 pack years	1.81	0.71	6.11	1.52-24.66	0.011
Constant	-0.89	0.34	-----	-----	-----

-2 (log-likelihood): 74.700, Model chi-square: 11.250, p = 0.004

Ghaffari and Alipour, 2006; Heliovaara, 1989; Battie and Videman, 2006). We prepared a checklist of these risk factors after literature review. Controlling confounding variables is a major challenge for case-control studies. We controlled the risk factors by restriction and paired matching. We restricted our study to male patients who hadn't history of shift work, drinking alcohol, diabetes, family history of low back pain and disc herniation, sedentary life style and history of trauma to low back. Also we controlled the effect of age by paired matching of cases and controls for age. Our sample dropped from 51 cases/controls to 31 cases/controls after controlling mentioned risk factors.

As we couldn't control the effects of Body Mass Index (BMI) and risky job-the job that may increase risk of disc degeneration- by restriction and matching, we tested their association with disk degeneration after gathering data. Chi square test and logistic regression analysis was used for testing the association between risk factors and disc degeneration.

RESULTS AND DISCUSSION

As Table 1 shows only smoking is significantly associated with disc degeneration. Logistic regression analysis shows that smoking 1 to 5 pack years and also more than 5 pack year are associated with increased risk of disk degeneration but this association isn't dose dependent (Table 2).

There is no clear association between smoking and disc degeneration in literature. A longitudinal study about risk factors for progression of lumbar spine disc degeneration shows that smoking hasn't any significant effects on progression of disc degeneration. Another study on pairs of identical twins who were highly

discordant for cigarette smoking revealed 18% greater mean disc degeneration scores in lumbar spines of smokers as compared with nonsmokers. In contrast with Likue and Solovieva (2005) there wasn't any significant association between BMI and disc degeneration in our study. Also unlike to Louma and Riihimaki (1998) there wasn't any relation between risky job and disc degeneration.

CONCLUSION

An analysis on cohort of Nurse's Health Study with about 98400 sample size shows that cardiovascular risk factors including high blood pressure and high cholesterol may be involved in lumbar disc degeneration (Jhavar *et al.*, 2006). This study showed that by quitting smoking the risk of lumbar disk herniation decreased. Our study showed that smoking is a risk factor for disc degeneration. Health education programs for prevention of disc degeneration may consider quitting cigarette smoking specially when there is co-morbidity between smoking and other major risk factors for arthrosclerosis.

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