

Comparative study of lumbar canal stenosis in patients with type 2 DM control vs uncontrolled

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Introduction

Diabetes a disease which effects almost every part of the body over the years of its infectivity. The prevalence rates of diabetes with cardiovascular disorders, neuropathy, retinopathy and others have increased over the years globally. During the recent years a lot of studies that have been published shows a strong relation of uncontrolled diabetes mellitus on the increased fragility of bones. Over the years it has been proven the strong relation of hyperglycemia on bone density and the increased reabsorption of bone in the presence of increased glucose levels in the blood. Though it has also been a topic of debate as there are other factors that affect the bone density but it can't be denied that hyperglycaemia is one them. One of the studies done by Adult Danio rerio on zebrafish represents a powerful model to study the relation between glucose and bone metabolism. The genome of zebrafish is quite similar to the human and has high resemblance to human counterparts, such as kidney, pancreas, adipose tissue, and skeletal muscle so to study the effect of high blood glucose on bones, sugar was administered into the water of zebrafish. Over the period of time it was noticed that there was significant reduction in the bone matrix, increased fragility and increased osteoclastic activity

apart from other effects done on retina, kidneys and nerve bundles, the kind of changes that were observed in the retina of a zebrafish administered with glucose to induce diabetes was very similar to that observed in a human retina in a patient with diabetic retinopathy. The increase in bone damages was directly proportional to the increased blood glucose levels. The lumbar area of the spinal cord is the area most affected in the whole spinal cord is because of the increased sitting posture and sedentary lifestyle in the growing generation. Hyperglycemia causes increased hypertrophic changes in ligaments flavum bulging disc posteriorly with consequent thecal sac compression and increases osteoclastic activity of the lumbar central canal, lateral recess, or the neural foramen decreasing the canal space for the spinal cord leading to symptoms starting with back pain and may even lead to weakness and decrease in the motor activity of lower limbs and sometimes in worst cases even paralysis. So therefore it is trivial to understand the role and duration of affect of hyperglycemia on lumbar canal stenosis.

Objective

The study is a retrospective and prospective study where two groups are taken which consists of group of controlled diabetes mellitus and group of uncontrolled

diabetes mellitus simultaneously. And a comparison study is done to relate the effect of DM Type 2 on the prevalence of lumbar canal stenosis.

Methods

The study was inspired by the increase number of both OPD and IPD cases of diabetes mellitus patients very frequently complaining of back pain getting temporary and minimal relief with the treatment of B12 and NSAID. On further evaluation and studying it was found that there is strong correlation between diabetes and lumbar canal stenosis. So over the year of 2 years from the total of 100 patients were taken and were further divided into 2 subgroups. The two groups complained of lower back pain, on and off, and showed no infection, metastasis, or postoperative spine symptoms, a non contrast MRI was done to evaluate the cause of lower back back and to rule out lumbar canal stenosis. The criteria for the diagnosis of DM were fasting plasma glucose ≥ 126 mg/dL, random plasma glucose ≥ 200 mg/dL and hemoglobin A1c (HbA1c) $\geq 6.5\%$. The first group A had 50 (n=50) patients with controlled diabetes mellitus with HBA1C < 7 and the second group B had 50 (n=50) patients with uncontrolled diabetes mellitus with HBA1c > 7 and higher, in these patients contrast MRI was done to evaluate lower back pain [1]. Though there new many scales to diagnose the intensity of lumbar canal stenosis but we used Oswestry Disability Index (ODI) [2]. The criteria we used were based on both clinical symptoms I.e presence of neurological claudication and disability in activities of daily living in those rehabilitating from low back pain for more than 2 months with compromise in the routine work and radiologically MRI finding suggestive of spinal canal stenosis based on the scales mentioned above.

Inclusion Criteria

Diabetes mellitus type 2 Duration of diabetes ≤ 10 years.

Exclusion Criteria

To exclude bias and to promote the transparency clear exclusion criteria were kept in this study 1) Age was taken between 30-60 years, to avoid the osteosclerosis due to age and mineral deficiency. 2) No past history of any spinal infection, trauma, tumour, smoking, diabetogenic drugs (steroids) 3) No past history of spinal canal surgery. 4) Patients in group B and C were of diabetes mellitus type 2 and other forms of diabetes like TYPE 1, MODY, TYPE 3c etc were excluded during the study by respective antibody tests. The control group patients were assessed for other risk factors leading to lumbar canal stenosis like smoking, occupational hazard, osteoporosis and other nutritional deficiency.

Statistical Analysis

The collected data were subjected to statistical analysis using SPSS version 16. Chi-square and Fisher's exact tests were used, with the significance level set at $P \leq 0.05$. the statistical analysis was done to prove the strong relation of development of lumbar canal stenosis in a patient of type 2 diabetes mellitus.

Result

As stated above to imply uniformity equal number of patients were taken in both the groups- all complaining of back pain on and off with the exclusion criteria. Therefore a total of 100 patients were taken in my study, there was no significant difference in sex, body mass index and other demographic data among all groups ($p > 0.05$). Individuals were categorised on the basis of their sugar control over the course of their diagnosis of diabetes till the development of back pain, neurological claudication and other signs and symptoms suggestive of lumbar canal stenosis. We categorised the patient of the basis of HBA1C levels into HBA1C- < 7 (Group A) and HBA1c levels > 7 (group B). Further stenosis of the

spinal canal based on the transverse diameter based on MRI findings was divided into
 MILD- 15mm-17mm
 MODERATE-10-15mm
 SEVERE- <10mm

Demographic Data

Table 1:

CHARACTERISTICS	GROUP A (n=50)	GROUP B (n=50)
No of patients	50	50
Age	40±10	42±10
BMI	18.9±1.8	20.1±1.4
HBA1C	<7	>7

CHARACTERISTICS	GROUP A (n=50)	GROUP B (n=50)
Neurogenic claudication	+	+++
Number of spinal segments involved	<2- 40 >2- 10	<2- 8 >2- 42
LSSS OR SPINAL CANAL STENOSIS	Group A (controlled DM) (n=50)	Group B (uncontrolled DM) (n=50)
MILD	38	8
MODERATE	12	20
SEVERE	0	22

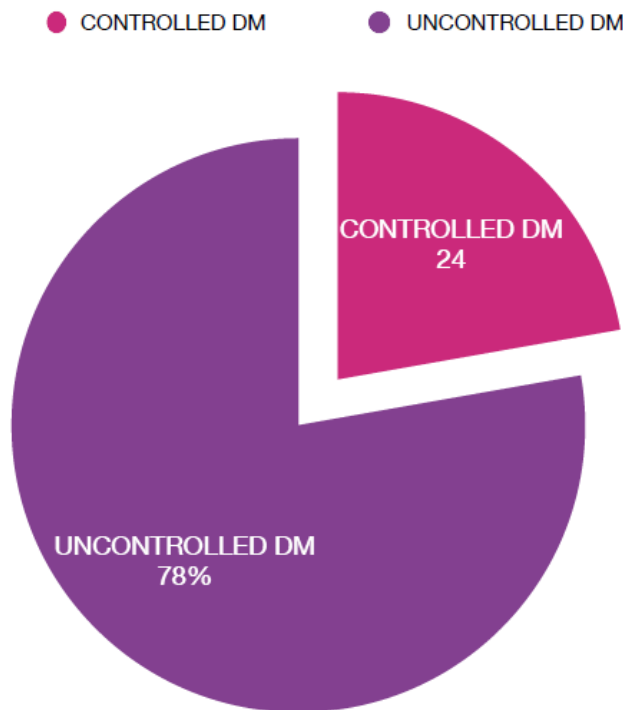


Chart 1: Percentage of Moderate-Severe LCS In Type 2 DM.

It is therefore seen that there is deteriorating effect of uncontrolled diabetes mellitus on the vertebral viability,

the above findings therefore conclude that in a patient of uncontrolled diabetes mellitus the chances of getting lumbar canal stenosis with moderate to severe disease was 20 to 22 out of 50 patients as compared to control diabetes mellitus where number of mild cases were 40 out of 50 patients and the progression of uncontrolled diabetes with severe lumbar canal stenosis to fatal levels of claudication is more as compared to patients of controlled diabetes mellitus with p value ($p < 0.05$) are the MRI images of moderate and severe lumbar canal stenosis in a patient of diabetes mellitus. Following are the MRI findings of a patient with moderate-severe lumbar canal stenosis in a patient of diabetes mellitus.

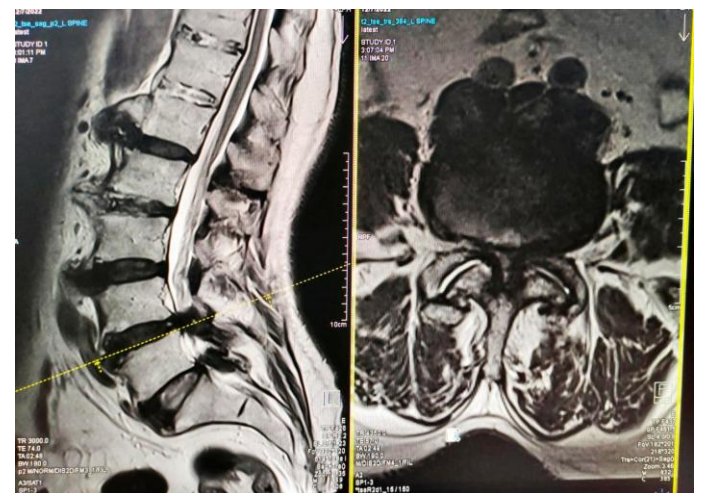


Figure 1: Diffuse posterior disk bulge with poster central annular tear and disc protrusion, ligamentum flavum thickening and facet arthropathy are seen at L4-L5 level causing indentation on ventral theca sac and narrowing of neural foramina with abutment over neural foramina, mild canal stenosis is seen.



Figure 2: Significant diffuse posterior disc bulge with posterocentral annular tear are seen L4-L5 level causing indentation on ventral thecal sac and narrowing of B/L neural foramina with compression over B/L traversing and left exiting nerve roots. Severe canal stenosis is seen.

Discussion

Diabetes mellitus is a multi systemic disorder and is been for years in our society without any cure, over the years it has severely affected the mortality and morbidity of patients increasing the years of disability. Not only it weakens our immune system but also affect almost every part of the body to an enzymatic level. Even though the diabetes is well controlled in an individual the risk of other macro and microvascular complications decreases significantly but not the risk is not completely eradicated. Its effect on bones is also debated on over the years, the studies done in the recent past gives a strong connection between diabetes and its deteriorating affect upon bone, decreasing the bone viability and increasing the chances of bone reabsorption leading to frequent fractures and bone injuries and increased inflammatory action of hyperglycemia causes increase in the hypertrophic action of the cells leading to complications like lumbar canal stenosis which further leads to problems like cauda equina if the compounding factor is still not controlled or treated. In DM, extracellular matrix changes may differ

from the normal aging process in two important ways: increased non-enzymatic cross-link of proteins by sugar glycosylation at lysine residues and decreased rate of proteoglycan synthesis [3] leading to decreased regeneration of bone and increasing the process of ageing.

In this study the focus was given on forming a relation between diabetes and lumbar canal stenosis and the affect of uncontrolled diabetes mellitus on the degree of lumbar canal stenosis and affect of controlled diabetes on the regression of the disease. This study also deals with affect of other risk factors other than diabetes in cases of our control.

References

1. Saifuddin A. The imaging of lumbar spinal stenosis. Clin Radiol. 2000 Aug; 55(8):581-94. [PubMed] [Reference list]
2. Measuring spinal canal size in lumbar spinal stenosis: description of method and preliminary results Andrew Hughes, Serik K. Makirov and Valentin Osadchiy International Journal of Spine Surgery January 2015, 9 8; DOI: <https://doi.org/10.14444/2008>
3. Anekstein Y, Smorgick Y, Lotan R, et al. Diabetes mellitus as a risk factor for the development of lumbar spinal stenosis. Isr Med Assoc J. 2010;12:16–20. [PubMed] [Google Scholar]
4. Mobbs RJ, Newcombe RL, Chandran KN. Lumbar discectomy and the diabetic patient: incidence and outcome. J Clin Neurosci. 2001;8:10–3. [PubMed] [Google Scholar]
5. Devogelaer JP, Maldague B. Lumbar spinal stenosis in metabolic bone disease. In: Gunzburg R, Szpalski M, editors. Lumbar Spinal Stenosis. Philadelphia, PA: Lippincott Williams & Wilkins; 1999. pp. 279–301. [Google Scholar]

6. Zhong ZM, Zha DS, Xiao WD, et al. Hypertrophy of ligamentum flavum in lumbar spine stenosis associated with the increased expression of connective tissue growth factor. *J Orthop Res.* 2011;29:1592–7. [PubMed] [Google Scholar]
7. Lee CK, Rauschnig W, Glenn W (1988) Lateral lumbar spinal canal stenosis: classification, pathologic anatomy and surgical decompression. *Spine (Phila Pa 1976)*.Google Scholar
8. Asadian, L., Haddadi, K., Aarabi, M. & Zare, A. Diabetes mellitus, a new risk factor for lumbar spinal stenosis: A case-control study. *Clin. Med. Insights Endocrinol. Diabetes* 9, 1– 5. <https://doi.org/10.4137/cmed.s39035> (2016).
9. Fabiane, S. M., Ward, K. J., Iatridis, J. C. & Williams, F. M. Does type 2 diabetes mellitus promote intervertebral disc degeneration?. *Eur. Spine J.* 25, 2716–2720. <https://doi.org/10.1007/s00586-016-4612-3> (2016).
10. Diabetes Mellitus and the Development of Lumbar Canal Stenosis: Is There Any Relevance? (PUB MED) Ghanshyam Kakadiya 1 , Kalpesh Saindane 1 , Yogesh Soni 2 , Kushal Gohil 3 , Akash Shakya 4 , Mohhamad Umair Attar 3