IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 19, Issue 10 Ser.5 (October. 2020), PP 57-60
www.iosrjournals.org

Computerized Tomogram as a Tool to Assess Early Morning Back Stiffness from Instability

Dr P.Venkatesan M.S.Orth Associate Professor of Orthopaedics
Dr..Kumaravel S, D.Orth, M.S.Orth, DNB Orth, Ph.D,
Professorof Orthopaedics
http://livedna.org/91.12367

Dr A SivasenthilD.OrthM.S.Orth
Assistant Professor of Orthopaedics

Dr. A Balaji MD RD
Assistant professor of Radiology Thanjavur medical college Thanjavur.
The Tamilnadu Dr MGR Medical University Chennai

Abstract
Early morning stiffness a common complaint mainly attributed to Rheumatoid arthritis from autoimmune diseases may also seen in degenerative conditions of spine .We had earlier studied 20 patients (7 males and 13 females) between 24 years to 65 years (mean age =39.9 years.) with low back ache with back stiffness using plain radiographs to assess their instability. We excluded spondyloarthropathy and HLA B27 positive patients or with multiple other joint involvement from the study. This is the study on using computerized tomogram as a tool to assess morning stiffness in backache in the same group of patients. CT scan of the lumbosacral spine was performed from L_1-S_1 with 5mmm thick sections at 3mm intervals to analyse the cause for instability. 3D reconstruction, sagittal and coronal reformations were performed to analyse translations. All the patients underwent MRI to identify root and cauda equina compression. Instability is indicated by retrolisthesis, Spondylolisthesis, disc space narrowing and presence of gas in disc or facet joints, enlargement or degeneration of the facet joint, juxta facet synovial cysts, capsular swelling or calcification; paraspinal muscle atrophy; positive twist — test for axial rotational instability. CT spine is useful adjunct to find the ethology for instability, changes from instability, in spine like the facet and sacroiliac joint. Accurate identification of subgroups within the population who, respond to specific interventions is vital for good treatment for chronic low backache.

Date of Submission: 02-10-2020 Date of Acceptance: 16-10-2020

I. Introduction

Early morning stiffness is a regular complaint of an orthopaedic patient. These are mainly attributed to Rheumatoid arthritis from autoimmune diseases, where activities reduce the pain but also in degenerative condition of unstable spine. The time extent of early morning stiffness varies among patients and it is significant only if it is more than one hour as per American rheumatology association.[1]Sometimes even without these findings early morning stiffness can be a presenting symptom.After ahypothesis that spinal instability can cause early morning stiffness-as the individual gets up in the morning. from supine to erect position while arising from bed. We had earlier studied patients with low back ache with back stiffness with plain radiographs to assess their instability. [2]This is the study on using computerized tomogram as a tool to assess morning stiffness in backache in the same group of patients.

II. Methodology

Only adult patients with low back ache and morning stiffness for a period of more than 3 months. Those patients with spondyloarthropathydiagnosed by Amor's criteria or rheumatoid arthritis as per the American Rheumatism Association 1987 revised criteria and HLA B_{27} positive and patients with patients with multiple other joint involvement were all excluded from the study.Of the 20 patients (7 males and 13 females) between 24 years to 65 years (mean age =39.9 years). Low backache history was elicited with specific stress on morning stiffness and examination done for structural deformities, alterations in movements of spine and specific area of tenderness.

CT scan of the lumbosacral spine was performed from L1-S1 with 5mm thick sections at 3mm intervals to analyse the cause for instability. 3D reconstruction, sagittal and coronal reformations were performed to analyse translations. A representative view is shown in the figures 1 and 2 below. All the patients underwent MRI to identify root andcauda equina compression.

Instability is indicated by retrolisthesis, spondylolisthesis, disc space narrowing, presence of gas in disc or facet joints, enlargement or degeneration of the facet joint, juxta facet synovial cysts, capsular swelling or calcification; paraspinal muscle atrophy; positive twist test for axial rotational instability. CT scan of the lumbosacral spine showed findings as shown in the table

Table showing CT spine findings

CT Findings	Case No.																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Etiology for Instability	D 45 P23 P34	F12	14D34	-	D56	I23	D56	F5	L45	D56	D45	-	L45	-	D45	-	D56	P4	D45	F3
Type of Instability	S45	L23	-	-	-	L45 R23 A23	-	-	-	-	-	-	-	-	-	R34	-	S45 S56	D45	A234 R34 L2-5
Instability changes	G56	-	M1	-	-	-	M5	-	-	-	-	-	M4 G56	M4	-	M4M5	M5	-	-	M2-4
Facet changes	A2-6 B34	A2-6	A4-5 A56	A1-5	A1-6	A1-5	-	-	A56	-	-	A34	A45 A56	-	-	A45 A56	A23 A56	A3-6	A4-6	A1-6 B4-6
Sacro – iliac joint	N	D	D	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	D

A Angular deformity , B Facet joint subluxation, D Degeneration. G Gas in disc
I Infection L - Lateralo-listhesis
M Macnab spur N Normal P Pars Defect
R RetrolisthesisS Spondylolisthesis

1-5 →Lumbar vertebra 1-5 6→ 1st sacral vertebra

Figure1.CT Lumbosacral spine with coronal reconstruction of a lumbar spondylosis patient showing lateral translation

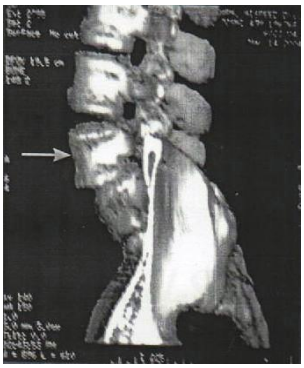

Figure 2.CT Lumbosacral spine with 3D reconstruction showing anterior translation of L_4

In our study, 13 patients (68%) showed degeneration of disc in MRI as the aetiology for instability. Many biomechanical studieshave reported the relation between disc degeneration and lumbar instability.[3] Panjabi et al found that neutral zones were significantly increased with disc degeneration, especially in axial rotation, anterior and posterior shear motions.[4] Kazarian found that degenerated discs creep faster and have less viscoelastic behaviour.[5]Morning stiffness as a symptom in Low backache is described only in Rheumatoid Arthritis and Spondyloarthropathies. The duration of stiffness in these conditions lasts for about 1 hour to a maximum of even 3 hours. On the contrary, in our study, duration of stiffness ranged from 10 minutes up to 60 minutes (mean 23.75 mm). It was expressed as a difficulty in moving around, on getting out of the bed. It has been postulated that morning stiffness in rheumatoid arthritis, is related to accumulation of oedema fluid within the inflamed tissues during sleep and it clears as edema and products of inflammation are reabsorbed by lymphatics and venules and returned to the circulation by the motion accompanying the use of muscles.[6]

Great bulk of the contribution for spinal stiffness is due to elastic stiffness.The elastic properties of the paraspinal muscles play a critical role in spine stabilization[7.]
Active and reflex muscle activity appear to contribute minimally to stiffness.[8]

In contrast, there is no inflammatory pathology causing edema fluid accumulation in lumbar instability. One explanation for morning stiffness could be due to the diurnal variations in the height of vertebral column.Tyrrell et a1 in their study showed in eight healthy men, the total height gained during sleep averaged 19.24 mm of which 71% was regained in the first half of the night. In the first hour after rising, 54% of the total diurnal change was lost and 83% was lost in the first 3 hours and 45 minutes. [9]Cyclic loading, mainly axial compression and hydrostatic pressure affect the disc tissue.[10]This is due to the fluctuation in the water content of the intervertebral disc. The intervertebral disc loses height under axial loading, whenever the osmotic pressure of the discal tissues is exceeded by the compressive load, fluid is expelled. This is followed by the changes in the dynamic response characteristics of the intervertebral joint complex and with time, a reduction in the resistance to static or dynamic or vibratory loading.[11]In a degenerated disc, deformation under load is more rapid.[12]

Wingetet al in their study have shown that range of flexion is least in the morning .This diurnal variation may in some way affect the abnormal disc or ligaments or muscles surrounding the unstable functional spinal unit leading to morning stiffness.[13] The shorter duration of stiffness in lumbar instability compared to Rheumatoid arthritis, may be due to rapid deformation under load in a degenerated disc.However the lower lumbar spinal involvement is lesser when compared to the cervical spine. [14]Tyrrell et al have further found that rest in Fowler's position gave more rapid regain in stature than post exercise recovery in standing positions.[9]

III. Conclusion

Accurate identification of subgroups within the population who respond to specific interventions is vital for good treatment for chronic low backache. CT spine is useful adjunct to find the etiology for instability, changes from instability in spine like the facet and sacroiliac joint.

References

[1]. F C Arnett , S M Edworthy, D A Bloch, D J McShane, J F Fries, N S Cooper, L A Healey, S R Kaplan, M H Liang, H S Luthra, et al.The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. Arthritis Rheum 1988 Mar;31(3):315-24.doi: 10.1002/art.1780310302.

[2]. Venkatesan P, Thirumalai Pandiyan D. Evaluation Of Morning Stiffness In Backache Clinical And Radiological Examination. RJPBCS 2018 9(4) Page No. 1702-08

[3]. Lorio JA, Jakoi AM, Singla A. Biomechanics of Degenerative Spinal Disorders. *Asian Spine J*. 2016;10(2):377-384. doi:10.4184/asj.2016.10.2.377

[4]. Panjabi, Manohar. (2003). Clinical spinal instability and low back pain. Journal of electromyography and kinesiology : official journal of the International Society of Electrophysiological Kinesiology. 13. 371-9. 10.1016/S1050-6411(03)00044-0.
[5]. Kazarian LE. Creep characteristics of the human spinal column. Orthop Clin North Am. 1975;6(1):3–18. [PubMed] [Google Scholar]
[6]. Gary S. Firestein, William N. Kelley, Ralph C. BuddKelley's Textbook of Rheumatology, Volume 1 - 2012 – p 1110 Elsevier Saunders
[7]. Maud Creze Dina Bedretdinova Posture- related stiffness mapping of paraspinal muscles https://doi.org/10.1111/joa.12978
[8]. Blackburn JT, Padua DA, Guskiewicz KM. Muscle stiffness and spinal stretch reflex sensitivity in the triceps surae. *J Athl Train*. 2008;43(1):29-36. doi:10.4085/1062-6050-43.1.29
[9]. T Reilly [1], A Tyrrell, J D TroupCircadian Variation in Human Stature Chronobiol Int 1984;1(2):121-6. doi: 10.3109/07420528409059129. PMID: 6600017
[10]. Chan SCW Ferguson SJ Ritter BG The effects of dynamic loading on the intervertebral disc .Eur Spine J (2011) 20:1796–1812 DOI 10.1007/s00586-011-1827-1
[11]. de Puky P Physiological oscillation of the length of the body Acta Orthopedica Scandinavica1935; 6:338
[12]. Alkalay RN, Vader D, Hackney D. The degenerative state of the intervertebral disk independently predicts the failure of human lumbar spine to high rate loading: an experimental study. *Clin Biomech (Bristol, Avon)*. 2015;30(2):211-218. doi:10.1016/j.clinbiomech.2014.09.016
[13]. Winget, C. M., DeRoshia, C. W., Holley, D. C.. Circadian rhythms and athletic performance. Med. Sci. Sports. Exerc. 1985, 17(5):498–516
[14]. https://orthop.washington.edu/patient-care/articles/arthritis/back-pain.html

Dr P.Venkatesan, et. al. "Computerized Tomogram as a Tool to Assess Early Morning Back Stiffness from Instability." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(10), 2020, pp. 57-60.