

# Evaluation of Lumbosacral Angle as New Parameters in Patients Suffering from Chronic Low Back Pain

Zahra Janamiri<sup>1\*</sup>, Yousef Moghimi Boldaji<sup>2</sup>, Fardis Mosayebian<sup>1</sup>

<sup>1</sup>Department of Radiology Technology, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>2</sup>Department of Medical Physics, Faculty of Medicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

\*Corresponding author: Zahra.janamiri@gmail.com

**Abstract** Introduction: The lumbar spine consists of five adjacent vertebrae of the mid-lower vertebral column. They participate in the lumbar lordosis, a natural curve in the spine, that is convex anteriorly. We plan to investigate the radiographic parameters of sagittal axis of the spine to assess clinical correlation. Methods: We have prospectively defined three parameters, including lumbar lordotic angle (LLA), lumbosacral angle (LSA) and sacral horizontal angle (SHA). We have enrolled 70 patients with chronic low back pain referred to our neurology clinic in a private hospital in Tehran for radiographical assessment, with 90 cm distant from x-ray tube and further radiological analysis was performed by an expert radiologist to correlate with clinical significance of these patients, compared with 70 otherwise healthy cases in control group. We have used SPSS version 16 and Student T-test and Chi-square test for statistical analysis. Results: Our study group consists of 70 patients with chronic low back pain with mean age of 56.3 years and 70 otherwise healthy patients with no complaint of low back pain, with mean age of 60.1 years old in control group. We have found that LSA angle is statistically significant in both male and female patients of case group. (P value < 0.05) Also, we have found that LLA angle is a single factor which is significantly correlated with low back pain in patients in male patients of case group. (P value < 0.05) However, SHA angle did not exhibit statistically significant correlation in patients with chronic low back pain in both groups. (P value = 0.091). Conclusion: In this prospective study, we have correlated radiographic features of lumbosacral structure of patients suffering from chronic low back pain and we have found statistically significant correlation between LSA in both genders and LLA in male patients and these finding may prompt the importance of further evaluation and investigation of bony structure of spine for better understanding and management of these patients.

**Keywords:** chronic low back pain, Radiographical Parameters, Lumbosacral

**Cite This Article:** Zahra Janamiri, Yousef Moghimi Boldaji, and Fardis Mosayebian, "Evaluation of Lumbosacral Angle as New Parameters in Patients Suffering from Chronic Low Back Pain." *American Journal of Medical Case Reports*, vol. 6, no. 4 (2018): 65-67. doi: 10.12691/ajmcr-6-4-3.

investigate the radiographic parameters of sagittal axis of the spine to assess clinical correlation.

## 1. Introduction

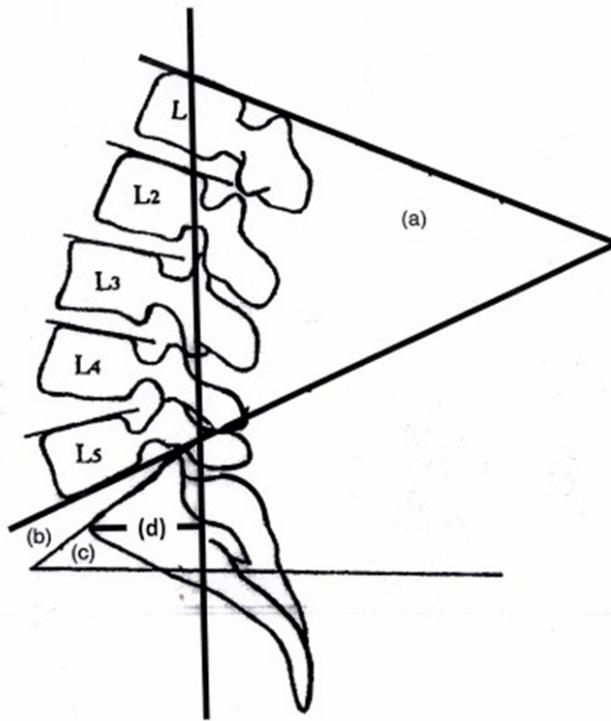
Low back pain (LBP) is defined as chronic after 3 months because most normal connective tissues heal within 6-12 weeks, unless pathoanatomic instability persists. [1] A slower rate of tissue repair in the relatively avascular intervertebral disk may impair the resolution of some persistent painful cases of chronic LBP (cLBP). [2] An estimated 15-20% develop protracted pain, and approximately 2-8% have chronic pain. Although disk herniation has been popularized as a cause of spinal and radicular pain, asymptomatic disk herniations on computed tomography (CT) and magnetic resonance imaging (MRI) scans are common. [3] However, base on literature review, authors suggest that anatomical variance of bony structure of spinal column have effect on force distribution and therefore, increased pain complaint in patients with altered normal anatomy and different angles especially at their lower part of the spinal column. [4] Thus we plan to

## 2. Methods

From 2013 to 2015, we have enrolled patients with cLBP who were referred to our neurology clinic in one of private hospitals in Tehran. We have enrolled 70 patients with cLBP and similar number of otherwise healthy individuals in case and control group respectively. Also, we have defined three parameters, including lumbar lordotic angle (LLA), lumbosacral angle (LSA) and sacral horizontal angle (SHA). (Figure 1)

Patients have signed written informed consent and also we did not enroll individuals with active spinal malignancies or infection and patients with previous history of spinal radiotherapy and patients with previous fractures in their spinal column, as well as patients with either congenital or acquired altered anatomy of their lumbosacral spine, or with kyphosis or scoliosis. We have performed radiological

assessment with 90 cm distant from x-ray tube and further radiological analysis was performed by an expert radiologist. We have used SPSS version 16 and Student T-test and Chi-square test for statistical analysis.



**Figure 1.** Angles: (a) lumbar lordosis, (b) lumbosacral joint, (c) sacral horizontal angle

### 3. Results

Our case group consists of 70 patients with chronic low back pain with mean age of 56.3 years (ranged between 35.7 years and 72.1 years) and 70 otherwise healthy individuals with no complaint of low back pain, with mean age of 60.1 years (ranged between 34 years and 69.7 years old in control group). We have not found any statistically significant differences in demographic data of patients. (P value = 0.12) We have found that LSA angle is statistically significant in both male and female patients of case group. (P value < 0.05) Also, we have found that LLA angle is a single factor which is significantly correlated with low back pain in patients in male patients of case group. (P value < 0.05) However, SHA angle did not exhibit statistically significant correlation in patients with chronic low back pain in both groups. (P value = 0.091).

### 4. Discussion

In approach to a patient with cLBP, several conditions may be responsible for complaint of the patients, including 1) mechanical disorders such as disc and facet motion segment degeneration, muscular pain disorders, discogenic pain, radiculopathy, spondylosis, instability of spinal column with or without radiographic hyper-mobile evidence of subluxation; 2) non mechanical disorders such as A) neurologic syndromes: myelopathy or myelitis from

structural processes, lumbosacral plexopathy, mono- or polyneuropathy, spinal segmental, lumbopelvic or generalized dystonia; B) systemic disorders: primary or metastatic malignancies, infectious processes of spinal column, inflammatory spondyloarthropathy, metabolic bone disorders; C) referred pain: gastrointestinal disorders, cardiorespiratory, disorders of the rib and sternum, thoracic and/or abdominal aortic aneurysm. [5,6,7,8,9] Vialle R et al found that a decrease in lumbar lordosis provides a better biomechanical loading position which may decrease the risk of LBP. [10,11] Different studies show that no significant differences were found between patients with LBP and control group regarding LSA. Chernukha et al found that maintaining a normal range of LLA is associated with preventing spinal disorders. [12] In the review of literature we found that lumbar lordosis is measured in different ways and from different levels, without measurement of L1-L5 segments. [13,14] Although clinical investigation and thorough neurological examination will enlighten underlying etiology of whether its origin is from anatomical disorder or not, simple radiographic analysis will exhibit features such as LSA, LLA and SHA for further evaluation. In this study, we have found that certain angles in spinal column in lumbosacral area, as we determined them, are related to severity of pain of patients suffering from cLBP, and our results may promote other authors for further investigation in finding of occult angles and other anatomical parameters, as they may be required in developing new rehabilitation devices.

### 5. Conclusion

In this prospective study, we have correlated radiographic features of lumbosacral structure of patients suffering from chronic low back pain and we have found statistically significant correlation between LSA in both genders and LLA in male patients and these finding may prompt the importance of further evaluation and investigation of bony structure of spine for better understanding and management of these patients.

### References

- [1] Allegri, M., Montella, S., Salici, F., Valente, A., Marchesini, M., Compagnone, C., Baciarello, M., Manferdini, M.E., Fanelli, G., "Mechanisms of low back pain: a guide for diagnosis and therapy," *F1000Research*, 5. 2016.
- [2] Petersen, T., Laslett, M., Juhl, C., "Clinical classification in low back pain: best-evidence diagnostic rules based on systematic reviews," *BMC musculoskeletal disorders*, 18(1). 188. 2017.
- [3] van Tulder, M.W., Koes, B., Malmivaara, A., "Outcome of non-invasive treatment modalities on back pain: an evidence-based review," *European spine journal*, 15(1). S64-81. 2006.
- [4] Barrett, B.J., "Acetaminophen and adverse chronic renal outcomes: an appraisal of the epidemiologic evidence," *American journal of kidney diseases*, 28(1). S14-9. 1996.
- [5] Fairbank, J., Frost, H., Wilson-MacDonald, J., Yu, L.M., Barker, K., Collins, R., "Randomised controlled trial to compare surgical stabilisation of the lumbar spine with an intensive rehabilitation programme for patients with chronic low back pain: the MRC spine stabilisation trial," *BMJ*, 330(7502). 1233. 2005.
- [6] Fritzell, P., Hägg, O., Wessberg, P., Nordwall, A., "Lumbar fusion versus nonsurgical treatment for chronic low back pain: a multicenter randomized controlled trial from the Swedish Lumbar Spine Study Group," *Spine*, 26(23). 2521-32. 2001.

- [7] Österman, H., Seitsalo, S., Karppinen, J., Malmivaara, A., "Effectiveness of microdiscectomy for lumbar disc herniation: a randomized controlled trial with 2 years of follow-up." *Spine*, 31(21). 2409-14. 2006.
- [8] Shaladi, A., Saltari, M.R., Piva, B., Crestani, F., Tartari, S., Pinato, P., Micheletto, G., Dall'Ara, R., "Continuous intrathecal morphine infusion in patients with vertebral fractures due to osteoporosis." *The Clinical journal of pain*, 23(6). 511-7. 2007.
- [9] Paice, J.A., Penn, R.D., Shott, S., "Intraspinal morphine for chronic pain: a retrospective, multicenter study," *Journal of pain and symptom management*, 11(2). 71-80. 1996.
- [10] Vialle, R., Levassor, N., Rillardon, L., Templier, A., Skalli, W., Guigui, P., "Radiographic analysis of the sagittal alignment and balance of the spine in asymptomatic subjects," *JBJS*, 87(2). 260-7. 2005.
- [11] Seddighi, A., Nikouei, A., Seddighi, A.S., Zali, A.R., Tabatabaei, S.M., Sheykhi, A.R., Yourdkhani, F., Naeimian, S., "Peripheral nerve injury: a review article," *International Clinical Neuroscience Journal*, 3(1). 1-6. 2016.
- [12] Childs, J.D., Cleland, J.A., Elliott, J.M., Teyhen, D.S., Wainner, R.S., Whitman, J.M., Sopky, B.J., Godges, J.J., Flynn, T.W., Delitto, A., Dyriw, G.M., "Neck pain: clinical practice guidelines linked to the International Classification of Functioning, Disability, and Health from the Orthopaedic Section of the American Physical Therapy Association," *Journal of Orthopaedic & Sports Physical Therapy*, 38(9). A1-34. 2008.
- [13] Seddighi, A., Nikouei, A., Seddighi, A.S., Zali, A., Tabatabaei, S.M., Yourdkhani, F., Naimian, S., Razavian, I., "The role of tranexamic acid in prevention of hemorrhage in major spinal surgeries," *Asian journal of neurosurgery*, 12(3). 501. 2017.
- [14] Brox, J.I., Storheim, K., Grotle, M., Tveito, T.H., Indahl, A., Eriksen, H.R., "Evidence-informed management of chronic low back pain with back schools, brief education, and fear-avoidance training," *The Spine Journal*, 8(1). 28-39. 2008.