

Normative MRI for Lumbar Spinal Canal and Vertebral Body Dimensions in a Jordanian Population Sample

*Hana' Qudsieh,^{1✉} Israa Al-Rawashdeh,² Basil Al Tah,³
Abdallah Daradkeh³ and Tareq Abualnadi³*

Abstract

Aim: To provide normal values for the lumbar spinal canal, lumbar vertebral body, and dural sac dimensions and canal body ratio by MRI for a Jordanian population sample.

Material and methods: Three well-trained observers reviewed 218 lumbar MRI scans performed between 2019–2021 (1090 lumbar levels) and obtained from the central computerized medical archive of three main governmental hospitals in north, central, and south Jordan. All MRIs with alignment abnormalities (scoliosis and kyphosis), canal compression, vertebral disease (including fractures), or technical artifacts were excluded. The following were measured from L1 to L5 levels: the midsagittal diameters of the spinal canal and vertebral body, axial anteroposterior (AP), and transverse diameter of the vertebral body, dural canal, and dural canal area. Data on sex and age were also documented.

Results: The studied MRI scans included 113 males (51.8%) and 105 females (48.2%). Age ranged between 23–86 years old (mean 52.23 ± 13.125). The mid sagittal mid vertebral AP diameter of the lumbar spine range was 2.8–3.1 cm. The mid-sagittal spinal canal diameter range was 1.3–1.5 cm. Canal body ratio was 3.3–3.6. The AP, transverse dural sac diameter ranges were 1.2–1.4 cm and 1.5–1.9 cm, respectively. Finally, the dural sac area ranged from 331–362 mm².

Conclusion: The dimensions of the lumbar spinal canal, vertebral bodies, and vertebral canal ratio at all levels were documented for a Jordanian population sample. Dimensions varied according to sex and when compared with other ethnic groups (Asian and African). The findings suggest that canal stenosis criteria should take these differences into consideration.

Keywords: Morphometric, lumbar spine, canal body ratio, canal stenosis, Jordanian

(J Med J 2023; Vol. 57 (4): 372–381)

Received

Accepted

April 5, 2021

September 15, 2022

INTRODUCTION

Spinal canal stenosis is quite a common problem, especially in the elderly, with younger people rarely affected [1]. It is most commonly caused by degenerative changes of the spine, mainly: disc herniation, facet synovial hypertrophy, ligamentum flavum hypertrophy,

facet joint hypertrophic osteoarthritic changes, osteophytes, and spondylolisthesis. Other causes, such as intraspinal tumor, congenital stenosis, and fractures, are also documented [2]. The most common site for degenerative spinal changes and spinal canal stenosis is the lumbar region [2, 3]. This region is the focus of our study, the aim of which was to achieve clinically valuable morphometric research.

Radiological measurements of the spinal canal are an essential part of the diagnosis of spinal canal stenosis and ectasia. Prior to determining the cutoff values for abnormal spinal morphometry, it is first necessary to establish the

¹ Department of Medicine and Radiology, Faculty of Medicine, Mutah University, Karak, Jordan

² Department of Public Health and Community Medicine, Faculty of Medicine, Mutah University, Karak Jordan

³ Student in Faculty of Medicine, Mutah University, Karak, Jordan

✉Corresponding author: Hqud_80@yahoo.com

normal values for a certain population. Various parameters have been used to evaluate the dimensions of the lumbar spinal canal and foraminal stenosis. The most frequently applied radiological parameters in different radiological imaging modalities are [4–6]:

- 1) The midsagittal anteroposterior (AP) diameter of the bony spinal canal: this represents the short distance between the posterior aspect of the vertebral body and the anterior margin of the posterior elements, either in the axial or sagittal plane. It is usually measured by a CT scan or conventional X-ray. Normal values vary at different lumbar levels from 27–32 mm [4, 5].
- 2) The midsagittal AP diameter of the dural sac: an AP diameter of less than 12 mm indicates stenosis, whereas less than 10 mm is stenosis [7].
- 3) The Torg Pavlov ratio (TPR), or canal body ratio (CBR): This is usually measured in the sagittal plane. The ratio used to be applied in the cervical spine, mainly on X-ray and CT scan. Few studies have measured this ratio on lumbar MRI, with varying results of 0.51–0.69 mm [8–10].
- 4) The interpedicular distance: this is the distance between the two pedicles in a frontal X-ray. Minimal normal values vary from L1, 23–24 mm to maximal at L5, 29.8–30.9 mm [4, 5].
- 5) The cross-sectional area of the spinal canal: a surface area reduction of the spinal canal of less than 100 mm² on two intervertebral levels is strongly associated with clinical spinal canal stenosis [4, 5].
- 6) Lateral recess height: This is the distance between the most anterior point of the superior articular facet and the posterior aspect of the vertebral body in axial images; a reduction in lateral recess height below 3 mm is indicative of lateral recess stenosis [4, 5].
- 7) The maximal AP diameter of the neuronal foramen: This is measured in the sagittal plane and represents foraminal stenosis. A threshold below 3 mm indicates foraminal stenosis [4, 5].

Despite the presence of numerous

parameters used to measure spinal canal stenosis, both normal window and cutoff values have been documented variably.

Conventional X-ray and computed tomography are used worldwide to assess the osseous spinal canal. However, soft-tissue abnormalities and structures may commonly contribute to secondary lumbar canal stenosis. Thus, MRI is preferred for evaluation of both soft tissue and bone structures [4, 5]. Accordingly, the morphometric measurements in this study were taken using MRI rather than conventional X-ray or CT scan for more precise, reliable results.

To our best knowledge, no previous studies have assessed the normal morphometry of the lumbar spine on MRI for a Jordanian population. This study, therefore, aims to provide normal values for the lumbar spinal canal, lumbar vertebral body, and dural sac dimensions, and canal body ratio for a Jordanian population sample measured using MRI.

MATERIAL AND METHODS

This retrospective study was approved by the Institutional Ethics Committee. Patients' written consent was requested due to the retrospective nature of the data collection and minimal risk. Some 218 MRI images (Siemens 1.5 Tesla) scanned between 2019–2021 in three governmental hospitals in the north, center and south of Jordan were reviewed by three trained observers under the direct supervision of a neuroradiologist using the Picture Archiving and Communication System (PACS). Measurements were performed using (MPTronic medical software ezDICOM CD VIEWER). All MRI images which showed fractures, spinal canal lesions, vertebral bony lesions, scoliosis, kyphosis, or technical artifact in the lumbar area were excluded.

On sagittal T2-weighted image (WI) of the lumbar spine, the midsagittal mid vertebral AP dimension (M) was measured for all lumbar vertebrae at the site of the posterior basovertebral vein penetration, parallel to the axis of the vertebra. At the same site, the AP dimensions of the spinal canal (N) were also measured all lumbar levels.

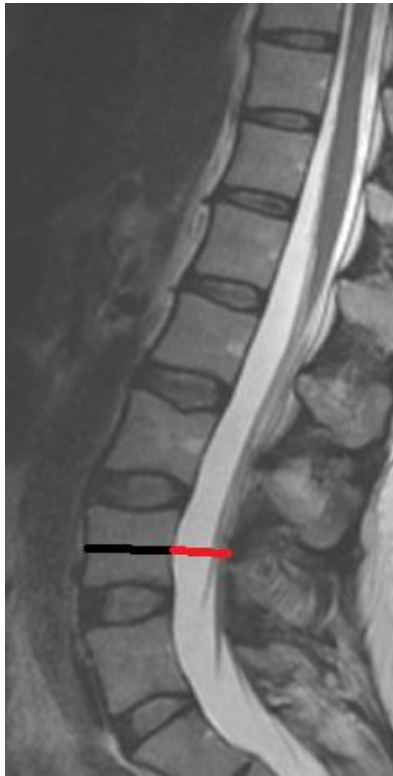


Figure 1. A 44-year-old male: sagittal T2WI of lumbar MRI. The black line (M) represents the AP dimension of the vertebral body at L4 level. The red line (N) represents the AP dimension of the spinal canal at L4 level

On the MRI axial T2 WI of the lumbar spine, the AP and maximal transverse dimensions of the dural sac (C and D) and vertebral body (A and B) were measured. The dural sac area (E)

was calculated by free-hand drawing measurement using the same previously mentioned viewing system.

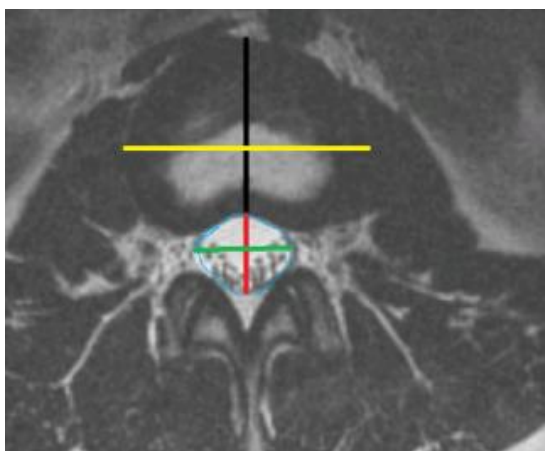


Figure 2. A 44-year-old male with low back pain: axial T2 WI of lumbar MRI. The black line (A) represents the AP dimension of the vertebral body. The yellow line (B) represents the maximum transverse dimension of the vertebral body. The red line (C) represents the maximal AP of the dural sac. The green line (D) represents the maximal transverse dimension of the dural sac. The area inside the blue free-hand drawings (E) represents the dural sac area

The mean values and standard deviation (SD) scores were calculated for different measurements of the canal body ratio (CBR) (N/M) and the dural sac body ratio (DBR) (C/A). The *p*-value was estimated as well, and a value less than 0.05 was considered significant.

RESULTS

A total of 218 MRI scans were examined. Data from 113 males (51.8%) and 105 females (48.2%) were collected. The mean age was 52.08 ± 13.28 for females and 52.38 ± 13.04 for males, with no significant difference between

the two groups ($p = 0.865$).

Table 1 shows the mean and SD values for all dimensions at different levels, including the vertebral body and dural sac dimensions. The mean scores of the midsagittal CBR, which represents the ratio between the midsagittal AP of the spinal canal to the midsagittal vertebral body (N/M), of L1, L2, L3, L4, and L5 vertebrae were 0.53 ± 0.12 , 0.46 ± 0.09 , 0.40 ± 0.09 , 0.42 ± 0.09 and, 0.49 ± 0.58 , respectively. The lowest mean was found at the L3 vertebral level, and the highest at the midsagittal CBR at L1 vertebral level.

Table 1. Mean and SD values for all dimensions at different levels

Level	M	N	N/M	E	A	C	C/A
L1	2.82 ± 0.34	1.45 ± 0.204	0.53 ± 0.12	1.97 ± 0.48	3.31 ± 0.44	1.35 ± 0.29	0.41 ± 0.10
L2	2.93 ± 0.33	1.35 ± 0.198	0.46 ± 0.09	1.8 ± 0.45	3.47 ± 0.4	1.28 ± 0.32	0.37 ± 0.1
L3	3.04 ± 0.34	1.28 ± 0.20	0.40 ± 0.09	1.62 ± 0.46	3.58 ± 0.38	1.22 ± 0.34	0.34 ± 0.11
L4	3.12 ± 0.43	1.3 ± 0.23	0.42 ± 0.09	1.58 ± 0.52	3.62 ± 0.37	1.28 ± 0.37	0.36 ± 0.11
L5	2.94 ± 0.41	1.33 ± 0.26	0.49 ± 0.58	1.62 ± 0.66	3.56 ± 0.41	1.29 ± 0.39	0.36 ± 0.11

N.B.: M: Midsagittal AP diameter of the vertebral body; N: Midsagittal AP diameter of the spinal canal;

N/M: Canal body ratio; E: The area of the dural canal; A: Axial AP diameter of the vertebral body; C: Axial AP diameter of the dural sac; C/A: Axial dural sac body ratio

The mean scores of the areas of the dural sac (E) at L1, L2, L3, L4, and L5 vertebrae were 1.97 ± 0.48 , 1.8 ± 0.45 , 1.62 ± 0.46 , 1.58 ± 0.52 , and 1.62 ± 0.66 , respectively. The smallest mean area was found at L4 and the largest at the L1 vertebral level.

The mean axial DBR (C/A) (the ratio between the AP of the dural sac to the AP of the

vertebral body in the axial plane) as measured at L1, L2, L3, L4, L5 vertebrae were 0.41 ± 0.10 , 0.37 ± 0.1 , 0.34 ± 0.11 , 0.36 ± 0.11 and 0.36 ± 0.11 , respectively. The lowest mean axial DBR was at L3, and the highest mean axial DBR was found at the L1 vertebral level.

Analyses of levels L1 to L5 for both genders are presented in Table 2.

Table 2. Midsagittal vertebral body and spinal canal measurements with the CBR (female = 105; male = 113)

Level	M		N		N/M	
	Male	Female	Male	Female	Male	Female
L1	3.00 ± 0.32	2.67 ± 0.27	1.42 ± 0.21	1.48 ± 0.19	0.48 ± 0.12	0.57 ± 0.09
<i>p</i> -value	<0.0001		0.049		<0.0001	
L2	3.10 ± 0.28	2.76 ± 0.30	1.31 ± 0.20	1.40 ± 0.18	0.43 ± 0.077	0.52 ± 0.10
<i>p</i> -value	<0.0001		0.001		<0.0001	
L3	3.17 ± 0.34	2.91 ± 0.30	1.25 ± 0.22	1.32 ± 0.19	0.40 ± 0.094	0.49 ± 0.83
<i>p</i> -value	<0.0001		0.010		<0.0001	
L4	3.25 ± 0.48	2.98 ± 0.33	1.31 ± 0.24	1.31 ± 0.22	0.41 ± 0.09	0.44 ± 0.09
<i>p</i> -value	<0.0001		0.891		0.006	
L5	3.04 ± 0.47	2.84 ± 0.32	1.38 ± 0.27	1.29 ± 0.24	0.53 ± 0.80	0.46 ± 0.098
<i>p</i> -value	<0.0001		0.007		0.344	

N.B.: M: AP mid-sagittal mid vertebral dimension of vertebral body; N: AP measurement of spinal canal; N/M: canal body ratio

A significant difference between males and females in the AP midsagittal mid vertebral dimension of the vertebral body was found at all five vertebral levels ($p < 0.0001$). The mean values of the sagittal AP diameter of the spinal canal showed significant differences between both sexes at vertebral levels of L1 ($p = 0.049$),

L2 ($p = 0.001$), L3 ($p = 0.010$), and L5 ($p = 0.007$), but not L4 ($p = 0.891$). The CBR mean values were significantly different for males and females at vertebral levels L1 ($p < 0.0001$), L2 ($p < 0.0001$), L3 ($p < 0.0001$), and L4 ($p = 0.006$). However, CBR did not show a significant difference at L5 ($p = 0.344$) (Figure 3).

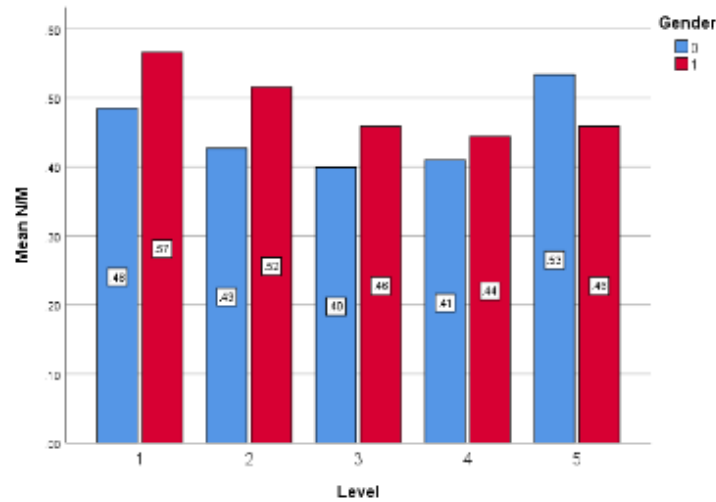


Figure 3. Difference in CBR by gender at different lumbar vertebral levels (blue represents males and red females)

As shown in Table 3, a significant difference was observed between males and females in the axial AP diameter of the vertebral body at all five levels ($p < 0.0001$). On the contrary, no

significant differences were found between males and females for either the dural sac area (E) or the AP dimension of the dural canal (C) at any of the five levels.

Table 3. Vertebral body and spinal canal AP axial dimension, dural sac area and DBR (female = 105) (male = 113)

Level	E		A		C		C/A	
	Male	Female	Male	Female	Male	Female	Male	Female
L1	1.95±0.48	1.99±0.48	3.49±0.36	3.15±0.44	1.35±0.36	1.34±0.20	0.39±0.11	0.43±0.091
p-value	0.212		<0.0001		0.291		0.617	
L2	1.76±0.49	1.85±0.40	3.62±0.31	3.31±0.44	1.28±0.42	1.29±0.17	0.36±0.12	0.40±0.09
p-value	0.146		<0.0001		0.778		0.005	
L3	1.62±0.51	1.63±0.40	3.69±0.40	3.48±0.35	1.24±0.44	1.22±0.18	0.35±0.15	0.35±0.07
p-value	0.921		<0.0001		0.582		0.601	
L4	1.58±0.57	1.59±0.48	3.71±0.39	3.52±0.34	1.29±0.47	1.28±0.25	0.35±0.14	0.37±0.88
p-value	0.843		<0.0001		0.717		0.397	
L5	1.68±0.75	1.57±0.55	3.68±0.42	3.43±0.37	1.32±0.48	1.26±0.27	0.36±0.14	0.37±0.08
p-value	0.212		<0.0001		0.291		0.617	

N. B.: E: Area of the dural canal; A: AP dimension of vertebral body in axial plane; C: AP dimension of dural canal; C/A: Dural body ratio

For the DBR, a significant difference was only found at L2 ($p = 0.005$) and there were no significant differences at all other vertebral levels.

Table 4 shows that the transverse dimension of the vertebral body (B) means were

significantly different between males and females at all measured vertebral levels. Whilst the means of the transverse dimension of the dural sac (D) were not different between sexes at any of the measured vertebral levels.

Table 4. Transverse dimension of the vertebral body and spinal canal at different levels

Level	Transverse dimension of vertebral body (B)				Transverse dimension of the dural sac (D)			
	Total	Male	Female	p	Total	Male	Female	p
L1	4.476±0.526	4.700±0.457	4.235±0.490	<.001	1.887±0.349	1.855±0.299	1.920±0.394	0.165
L2	4.673±0.573	4.938±0.453	4.387±0.552	<.001	1.8144±.37057	1.770±0.379	1.863±0.357	0.065
L3	4.881±0.573	5.107±0.450	4.638±0.594	<.001	1.697±0.379	1.641±0.359	1.756±0.391	0.24
L4	4.939±0.545	5.0851±.538	4.7817±0.520	<.001	1.540±0.330	1.521±0.361	1.561±0.293	0.36
L5	4.984±0.579	5.192±0.527	4.760±.550	<.001	1.563±0.410	1.560±0.443	1.565±.373	0.924

DISCUSSION

Many definitions have been used for lumbar spinal canal stenosis to help diagnose this clinical condition. According to the British Association of Spine Surgeons 'spinal canal stenosis describes a narrowing of the spinal canal that gives rise to symptoms due to compression of the spinal nerves or sometimes the spinal cord' [1]. These symptoms include: low back pain, leg pain, numbness, weakness, and claudication. Lumbar spinal canal stenosis is defined in the guidelines of the North American Spine Society as 'buttock or lower extremity pain, which may occur with or without low back pain, associated with diminished space available for the neural and vascular elements in the lumbar spine' [11, 12]. Both definitions link clinical symptoms with radiological findings, although the radiological criteria for the narrowing of the spinal canal stenosis are still clearly undetermined.

The CBR (N/M), dural sac area (E), and dural sac dimensions (C/D) are different measurements used to assess spinal canal narrowing radiologically. Before determining the cutoff values of a narrowed or dilated spinal canal, the normal range must be set using the most accurate imaging modality for lumbar spinal canal assessment. Comparative studies between different imaging modalities found that MRI is the most sensitive and best mode for the spinal canal [7] due to its ability to visualize both soft tissue and bony structures [13, 14].

As well as the normal values for the lumbar spine that our study has presented in a Jordanian

population, we note that the vertebral body dimensions decrease from L1 to L4/L5, with a maximum transverse dimension at L5 and maximum AP dimension at L4. This variation in dimension gives 'geometric' stabilization of the vertebral column during flexion, extension, and axial rotational movement. Further, it preserves normal alignment and lumbar lordosis.

The larger bony skeleton in males in comparison to females was also recognized in our results. Despite the significant difference of the bony vertebral dimension between different males and females, there was no such significant difference for the dural sac dimensions (C/D) and dural sac area (E). Our results also indicated that the dural sac area was largest at the L1 level and smallest at L4. This may explain why the L4–L5 level is the most affected by clinical spinal canal stenosis, in addition to the fact that the maximal axial load is greater at this level.

The definition of the CBR (N/M) is different from the DBR (C/A) and should not be used interchangeably, as many researchers have done. On axial T2 WI, the dural sac outline and borders were recognized from nearby structures, mainly epidural fats and ligaments; however, they are less recognizable in the sagittal images. Therefore, the measurement of the dural sac is preferred on axial rather sagittal images. The difference in the values of CBR (N/M) and DBR (C/M) was obvious at the L5 level, where the intraspinal tissue around the dural sac is more abundant.

We compared our results with studies on Indian, Korean, and Black populations, as shown in Table 5 [8–10, 13].

Table 5. Different ethnic lumbar spine morphometry studies

Study	Sample size (patients)	Results of the parameters used at different levels
Premchandran et al. [8] (Indian)	154	- Area of the Dural Sac: Males: (L1: 228.18) (L2: 223.35) (L3: 219.35) (L4: 226.57) (L5: 215.92) Female: (L1: 198.57) (L2: 191.43) (L3: 190.66) (L4: 196.36) (L5: 187.11) - CBR: Male: (L1: 0.69) (L2: 0.65) (L3: 0.63) (L4: 0.55) (L5: 0.52) Female: (L1: 0.68) (L2: 0.60) (L3: 0.59) (L4: 0.54) (L5: 0.51) - Dural sac diameter (mm): Male: (L1: 18.05) (L2: 17.31) (L3: 16.48) (L4: 16.18) (L5: 15.83) Female: L1 15.68/ L2 14.06/ L3 14.98/ L4 14.14/ L5 13.92
Inder Pawar et al. [13] (Indian)	30	- The mean spinal canal diameter (mm): (L1: 11.85 ± 1.14) (L2: 12.27 ± 1.20) (L3: 12.73 ± 1.15) (L4: 12.98 ± 1.09) (L5: 13.11 ± 1.40)
Lee et al. [9] (Korean)	1800	- The mid sagittal diameter of spinal canal (mm): Male: (L1: 15.4) (L2: 14.3) (L3: 13.6) (L4: 14) (L5: 14.6) -Mid sagittal diameter vertebral (mm): (L1: 29.1) (L2: 30.8) (L3: 32.3) (L4: 33.7) (L5: 33.2) - CBR: Male: (L1: 0.53) (L2: 0.46) (L3: 0.42) (L4: 0.42) (L5: 0.44)
Eisenstein et al. [10] Blacks in South Africans	433	- Mid sagittal diameter of spinal canal (mm): Male: (L1: 16.6) (L2: 15.8) (L3: 14.9) (L4: 15.6) (L5: 16) - Mid sagittal diameter vertebral (mm): Male: (L1: 29.2) (L2: 30.6) (L3: 32.2) (L4: 34) (L5: 32.2) - CBR: Male: (L1: 0.6) (L2: 0.5) (L3: 0.5) (L4: 0.5) (L5: 0.5)

Evidence from these studies shows that the lower vertebral mid sagittal dimension is larger in Black and Korean populations compared to Jordanians, especially at the L5 level. Moreover, the mid sagittal diameter of the spinal canal is found to be larger in Black, and almost similar to Korean, but smaller in Indian, with a smaller dural sac area.

The disparities in the outcomes between these population samples with varying ethnic backgrounds—Black, Middle Eastern, and Far Eastern races—, as recognized upon reviewing the limited available evidence, may indicate that spine morphometry has population-specific variations. This highlights the need for more data on various population groups and possibly advanced statistical methods to show these differences. This might not be feasible in Jordan

due to the homogenous nature of the Jordanian population and limited variety of ethnic or racial origins [15].

This research has its limitations. We examined a smaller number of MRIs than expected due to feasibility issues, such as having to obtain separate permission to access the PACS system of the three governmental hospitals; moreover, there was, at the time of the research, no central dataset for the PACS system connecting all governmental hospitals. Nonetheless, data were collected from three different geographic areas—north, central, and south Jordan—to overcome the limited access and ensure geographical representativeness. Data were also collected during a period of lockdown due to COVID-19, which added to the challenges of this research.

Lack of reporting details on clinical symptoms in the PACS data for patients who were scanned by MRI made investigating associations between different dural sac/ spinal canal parameters and clinical symptoms unfeasible. Thus, we could not determine the radiological criteria used to distinguish the clinically significant or surgically-indicated management of canal narrowing.

CONCLUSION:

The study obtained lumbar spinal morphometry for a Jordanian population. Our findings provide baseline normative data for the evaluation of patients presenting with low back pain and who are suspected to have lumbar canal stenosis in the Jordanian population.

Dural canal dimensions and area, as well as the CBR, are valid parameters for determining clinical spinal canal stenosis; however, these are still not fully developed, especially with no clear clinically based radiological criteria. Investigating the relationship between the severity of clinical symptoms and these parameters in a case-control study is strongly

suggested to determine the normal cutoff values and the degree of stenosis that may necessitate surgical manipulation.

The morphometry of the lumbar spine is multifactorial [16]. For example, gender, lumbar level, and ethnic group can all be factors influencing measures of morphometry. Future research on the effect of these factors on different spine parameters is recommended.

Declaration

Conflict of interest: None.

Acknowledgments: No.

Availability of data: Available.

Funding: None.

Abbreviations

AP: Anteroposterior

CBR: Canal body ratio

CDR: Canal dural ratio

CT: Computerized tomography

MRI: Magnetic resonance imaging technique

PACS: Picture archiving and communication system

TPR: Torg Pavlov Ratio

REFERENCES

1. British Association of Spine Surgeons. Spinal Stenosis. <https://spinesurgeons.ac.uk/Spinal-Stenosis>; 2019.
2. Kushchayev, S.V., Glushko, T., Jarraya, M. et al. ABCs of the degenerative spine. *Insights Imaging* 2018; 9: 253-274.
3. Alshami AM. Prevalence of spinal disorders and their relationships with age and gender. *Saudi Med J* 2015; 36: 725-30.
4. Ulbrich EJ, Schraner C, Boesch C, Hodler J, Busato A, Anderson SE, et al. Normative MR cervical spinal canal dimensions. *Radiology* 2014; 271: 172-182.
5. Waldt S, Gersing A, Brügel M. Measurements and classifications in spine imaging. *Semin Musculoskelet Radiol* 2014; 18: 219-227
6. Yadav U, Singh V, Bhargava N, Kumar Srivastav A, Neyaz Z, Phadke RV, Mishra P. Lumbar Canal Diameter Evaluation by CT Morphometry-Study of Indian Population. *Int J Spine Surg* 2020; 14: 175-181.
7. Anasuya DG, Jayashree A, Moorthy NLN, Madan S. Anatomical study of lumbar spinal canal diameter on MRI to assess spinal canal stenosis. *Int J Anat Res* 2015; 3: 1441-1444.
8. Premchandran D, Saralaya VV, Mahale A. Predicting lumbar central canal stenosis - a magnetic resonance imaging study. *J Clin Diagn Res* 2014; 8: RC01-4.
9. Lee HM, Kim NH, Kim HJ, Chung IH. Morphometric study of the lumbar spinal canal in the Korean population. *SPINE* 1995; 20: 1979-1984.
10. Eisenstein S. The morphometry and pathological anatomy of the lumbar spine in South African negroes and caucasoids with specific reference to spinal stenosis. *J Bone Joint Surg* 1977; 59: 173-180

11. Mamisch N, Brumann M, Hodler J, et al. Radiologic criteria for the diagnosis of spinal stenosis: results of a Delphi survey. *Radiology* 2012; 264: 174-179.
12. Kreiner DS, Shaffer WO, Baisden JL, et al. An evidence-based clinical guideline for the diagnosis and treatment of degenerative lumbar spinal stenosis (update). *Spine J* 2013; 13: 734-743.
13. Pawar I, Kohli S, Kumar V, Narang S, Singhal A, Dalal V. Magnetic resonance imaging in the diagnosis of Lumbar Canal stenosis in Indian patients. *J Orthop Allied Sci* 2014; 2: 53.
14. Steurer J, Roner S, Gnannt R, Hodler J. Quantitative radiologic criteria for the diagnosis of lumbar spinal stenosis: a systematic literature review. *BMC Musculoskelet Disord* 2011; 12: 175.
15. Oracle. Population – Department of Statistics. <https://dosweb.dos.gov.jo/population/population-2>; 2021.
16. Qudsieh H, Al-Rawashdeh I, Daradkeh A, Abualnadi T, Al Tah B. Variation of Torg-Pavlov Ratio with Age, Gender, Vertebral Level, Dural Sac Area, and Ethnicity in Lumbar Magnetic Resonance Imaging. *J Clin Imaging Sci* 2022; 12: 53.

القيم المعيارية (الطبيعية) للقناة الشوكية القطنية والجسم الفقري القطني للأردنيين باستخدام الرنين المغناطيسي

هناء قدسية¹، إسراء الرواشدة²، عبدالله درادكة³، طارق أبو النادي³، باسل التح³

¹ قسم الباطني ، الأشعة، كلية الطب ، جامعة مؤتة، الكرك، الأردن.

² قسم الصحة العامة وطب المجتمع، كلية الطب ، جامعة مؤتة، الكرك، الأردن.

³ طالب ، كلية الطب جامعة مؤتة، الكرك، الأردن.

الملخص

الخلفية والأهداف : إيجاد القيم المعيارية - باستخدام الرنين المغناطيسي - لأبعاد القناة الشوكية القطنية و الجسم الفقري القطني وأبعاد مساحة الكيس الجافي وحساب النسبة في المقطع السهمي بين البعد الامامي-الخلفي للقناة الشوكية والجسم الفقري القطني لعينة من السكان الأردنيين. **منهجية الدراسة :** تم مراجعة 218 فحص رنين مغناطيسي أجريت ما بين عام 2019-2021 (1090 مستوى قطني) تم الحصول عليها من الأرشيف الطبي المركزي المحوسب لثلاثة مستشفيات حكومية رئيسية في شمال ووسط وجنوب الأردن. استنتجت من الدراسة جميع صور الرنين المغناطيسي التي اظهرت تشوهات في استقامة العمود الفقري (الجنف والحداب) او اي ضغط على القناة الشوكية ، أو اي اعتلالات ظاهرة بالعمود الفقري بما في ذلك الكسور . وبطبيعة الحال تم استثناء الصور التي تحمل اخطاء تقنية والتي تؤثر على وضوح الصورة . باستخدام صور الرنين المغناطيسي قام ثلاثة اشخاص (تم تدريبهم سابقا) بقياس الابعاد التالية ذكرها لكل من المستويات القطنية الخمسة: ابعاد الكيس الجافي وابعاد الجسم الفقري القطني (البعد الامامي-الخلفي والمستعرض باستخدام المقطع المحوري) ، كما تم قياس البعد الامامي-الخلفي لكل من القناة الشوكية والجسم الفقري القطني باستخدام المقطع السهمي ثم حساب القيم المعيارية للنسبة بينهما ، واخيرا تم حساب مساحة الكيس الجافي و توثيق جنس المرضى واعمارهم أيضا.

النتائج: شملت فحوصات التصوير بالرنين المغناطيسي التي تمت دراستها 113 ذكرا (51.8%) و 105 انثى (48.2%) تراوحت اعمارهم ما بين 23 إلى 86 سنة بمتوسط عمر 52.23 ± 13.125 سنة . كان معدل قطر الجسم الفقري في المقطع السهمي يتراوح بين 2.8-3.1 سم. بينما معدل قطر القناة الشوكية في المقطع السهمي 1.3-1.5 سم. تراوحت النسبة بين القطر الامامي-الخلفي للقناة الشوكية والجسم القطني في المقطع السهمي بين 3.3-3.6 سم. كان معدل القطر الامامي-الخلفي والمستعرض للكيس الجافي في المقطع المحوري 1.2-1.4 سم و 1.5-1.9 سم على التوالي. وأخيرا تراوحت مساحة كيس الجافية من 331 إلى 362 مم².

الاستنتاج: تم توثيق أبعاد القناة الشوكية القطنية والجسم الفقري القطني وكذلك نسبة البعد الامامي-الخلفي السهمي بين القناة الشوكية والجسم الفقري على جميع المستويات القطنية لعينة من السكان الأردنيين. وقد وجد أن هذه الأبعاد تختلف وفقا للجنس و العرق وذلك بعد مقارنتها بالمجموعات العرقية الأخرى (الآسيوية والأفريقية). وبناء على ذلك، يجب اخذ هذه الاختلافات بعين الاعتبار وخصوصا عند تقييم تضيق القناة الشوكية.

الكلمات الدالة: القيم المعيارية، العمود الفقري القطني، نسبة قطر القناة للجسم القطني، تضيق القناة الشوكية، الأردن.