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Original article

Roussouly Sagittal Spinopelvic Morphotypes in Patients with Lumbar Disc Herniation: Distribution, Herniation Level, and Interobserver Reliability

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Abstract

Sagittal spinopelvic morphology has been implicated in the biomechanical environment of the lumbar spine and may influence susceptibility to lumbar disc pathology. However, data on the distribution of Roussouly morphotypes in patients with lumbar disc herniation (LDH) remain limited.

Objective: To evaluate the distribution of sagittal spinopelvic morphotypes according to the Roussouly classification in patients with LDH, to investigate their relationship with herniation level, and to assess interobserver reliability of the classification.

Methods. This retrospective cross-sectional single-center study included 256 patients with LDH. Age, sex, disc herniation level, pelvic incidence (PI), sacral slope (SS), and pelvic tilt (PT) were recorded. Herniation levels were classified as L2–3, L3–4, L4–5, and L5–S1; L2–3 and L3–4 were additionally grouped as upper lumbar for comparative analyses. Sagittal spinopelvic morphology was classified as Roussouly type 1, 2, 3, or 4 by two independent observers. Associations between Roussouly type and herniation level were analyzed using chi-square tests, and spinopelvic parameters were compared among morphotypes.

Results. The most common herniation level was L4–5 (54.3%), followed by L5–S1 (32.4%). The most frequent morphotype was type 3 (42.6%), followed by type 2 (37.9%), type 1 (13.7%), and type 4 (5.9%). No significant association was found between Roussouly type and herniation level ($p = 0.220$). In contrast, PI and SS differed significantly among Roussouly types (both $p < 0.001$), whereas PT did not ($p = 0.341$). Interobserver agreement for Roussouly classification was excellent, with a Cohen's kappa of 0.935 and a quadratic weighted kappa of 0.967.

Conclusions. Sagittal spinopelvic morphotypes were not evenly distributed in patients with LDH. Although type 3 was the most common morphotype, this likely reflects its high prevalence in asymptomatic populations. The notable representation of type 1 and especially type 2 morphotypes suggests that flatter sagittal profiles may represent a potentially relevant morphologic pattern in LDH. No significant association was found between morphotype and herniation level. The Roussouly classification demonstrated excellent interobserver reliability in this cohort.

Keywords: lumbar disc herniation, Roussouly classification, sagittal spinopelvic alignment, pelvic incidence, interobserver reliability.

1. Introduction

Lumbar disc herniation (LDH) is a common cause of low back pain and radicular leg pain. Beyond disc degeneration, sagittal spinopelvic morphology may contribute to the development of lumbar disc pathology by altering load distribution across the intervertebral discs and posterior elements [1,2].

The Roussouly classification describes four principal patterns of normal standing sagittal lumbopelvic alignment and provides a biomechanical framework for understanding morphologic variation [3]. Subsequent studies have suggested that these morphotypes may also reflect differential susceptibility to degenerative spinal disorders [4,5].

Previous studies examining sagittal alignment and lumbar disc degeneration have suggested that flatter or hypolordotic profiles may be associated with less favorable mechanical loading of the lumbar spine [6-8]. However, the relationship between Roussouly morphotypes and lumbar disc pathology remains incompletely defined. Some studies have reported associations between specific morphotypes and degenerative patterns, whereas others have found weaker or inconsistent relationships [8-10]. Data specifically addressing Roussouly classification in patients with LDH are limited. Chen et al. reported that L5-S1 herniation was more frequent in type 1 and type 2 morphotypes, whereas L4-L5 herniation was more common in type 2 and type 3 morphotypes in young patients with LDH [10]. Whether these findings apply to broader LDH populations remains uncertain.

Interobserver reliability is also critical when evaluating any imaging-based classification system [11, 12]. Accordingly, the present study aimed to determine the distribution of Roussouly morphotypes in patients with LDH, assess their relationship with herniation level, and evaluate interobserver reliability. We hypothesized that morphotype distribution would be nonuniform and that specific Roussouly types would be associated with specific herniation levels.

2. Materials and methods

Study Design and Patient Selection

This retrospective cross-sectional single-center study was based on existing clinical and radiographic records of patients who were recommended for surgery for single-level lumbar disc herniation between 2015 and 2025. All data were obtained from a single center, and patient identifiers were removed before analysis. No direct patient contact, examination, or intervention was performed during the study. Patients with available demographic, radiographic, and spinopelvic data were included. Cases with previous lumbar surgery, evident spinal deformity, spondylolisthesis, multilevel complex pathology, or inadequate image quality were excluded. A total of 256 patients were included in the final analysis. For each patient, age, sex, and disc herniation level were recorded. Disc herniation levels were classified as L2–3, L3–4, L4–5, and L5–S1. Because of the relatively small number of cases at the upper lumbar levels, L2–3 and L3–4 were additionally grouped as the upper lumbar category for comparative analyses. A flow diagram of patient selection is presented in Figure 1.

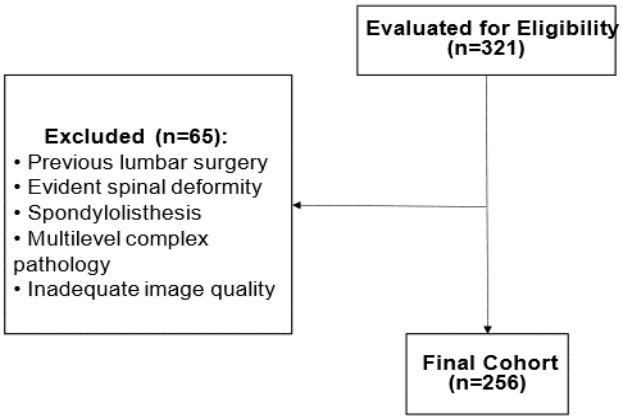

Figure 1 - Flow diagram of patient selection

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Radiographic Evaluation

Spinopelvic evaluation was performed on standing lateral radiographs obtained in a standardized upright position. The following parameters were measured for each patient according to standard radiographic definitions: pelvic incidence (PI), sacral slope (SS), and pelvic tilt (PT). Sagittal spinopelvic morphology was then classified according to the Roussouly classification as type 1, type 2, type 3, or type 4 based on overall sagittal profile and spinopelvic parameters.

Roussouly classification was independently assessed by two spine surgeons who were blinded to each other's measurements. Each observer's classification was recorded separately for interobserver agreement analysis. In cases of disagreement, the final Roussouly type used for the main analyses was determined by consensus after joint review of the radiographs.

Statistical Analysis

Statistical analyses were performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation, and categorical variables as number (percentage). Comparisons of continuous variables among Roussouly types were performed using one-way analysis of variance (ANOVA). Associations between categorical variables were evaluated using the chi-square test. Interobserver agreement for Roussouly classification was assessed using Cohen's kappa and quadratic weighted kappa. A two-sided p value < 0.05 was considered statistically significant.

3. Results

A total of 256 patients were included in the study. The baseline characteristics of the cohort and the distribution of disc herniation levels are presented in Table 1. Regarding herniation level, 139 patients (54.3%) had L4–5 disc herniation, 83 (32.4%) had L5–S1 herniation, 23 (9.0%) had L3–4 herniation, and 11 (4.3%) had L2–3 herniation. Because of the relatively small number of cases at the upper lumbar levels, L2–3 and L3–4 were combined into an upper lumbar group, comprising 34 patients (13.3%).

Table 1 - Baseline characteristics of the study cohort and distribution of disc herniation levels

Variable	Value
Total patients, n	256
Age, mean ± SD	45.2±12.6
Female, n (%)	131 (51.2)
Male, n (%)	125 (48.8)
Pelvic incidence (PI), mean ± SD	47.3±10.0
Sacral slope (SS), mean ± SD	35.1±6.7
Pelvic tilt (PT), mean ± SD	12.2±7.7
L2–3, n (%)	11 (4.3)
L3–4, n (%)	23 (9.0)
L4–5, n (%)	139 (54.3)
L5–S1, n (%)	83 (32.4)
Upper lumbar (L2–3 + L3–4), n (%)	34 (13.3)

The distribution of Roussouly morphotypes is shown in Table 2. The most common morphotype was type 3 (n=109, 42.6%), followed by type 2 (n=97, 37.9%), type 1 (n=35, 13.7%), and type 4 (n=15, 5.9%).

Table 2 - Distribution of Roussouly morphotypes

Roussouly type	n (%)
Type 1	35 (13.7)
Type 2	97 (37.9)
Type 3	109 (42.6)
Type 4	15 (5.9)

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The association between Roussouly type and disc herniation level is presented in Table 3. No statistically significant difference in morphotype distribution was found among the upper lumbar, L4–5, and L5–S1 groups (p=0.220).

Table 3 - Association between Roussouly type and disc herniation level

Roussouly morphotype	Upper lumbar, n (%)	L4–5, n (%)	L5–S1, n (%)
Type 1	7 (20.0)	18 (51.4)	10 (28.6)
Type 2	17 (17.5)	55 (56.7)	25 (25.8)
Type 3	9 (8.3)	58 (53.2)	42 (38.5)
Type 4	1 (6.7)	8 (53.3)	6 (40.0)

Percentages are shown within each Roussouly type. The p value was determined using the chi-square test (p = 0.220)

Comparisons of age and spinopelvic parameters according to Roussouly type are summarized in Table 4. There was no significant difference in age among the Roussouly types (p=0.094). In contrast, both pelvic incidence (PI) and sacral slope (SS) differed significantly among the morphotypes (both p<0.001). In general, lower PI and SS values were observed in type 1 and type 2, whereas higher values were found in type 3 and type 4. Pelvic tilt (PT) did not differ significantly among the groups (p=0.341)

Table 4 - Comparison of demographic and spinopelvic parameters according to Roussouly type

Variable	Type 1	Type 2	Type 3	Type 4	p value
Age, mean ± SD	42.5±10.9	45.8±11.3	46.3±13.7	38.9±14.3	p=0.094
Pelvic incidence (PI), mean ± SD	41.1±7.1	41.8±6.2	52.5±9.3	60.1±9.9	p<0.001
Sacral slope (SS), mean ± SD	28.7±5.0	30.6±3.5	39.3±2.9	49.2±3.7	p<0.001
Pelvic tilt (PT), mean ± SD	12.5±6.7	11.3±5.8	13.1±9.2	10.9±7.5	p=0.341

P values were calculated using one-way analysis of variance (ANOVA)

Interobserver agreement for Roussouly classification is presented in Table 5. Agreement between the two observers was excellent, with both Cohen's kappa and quadratic weighted kappa indicating a very high level of reproducibility

Table 5 - Interobserver agreement for Roussouly classification

Agreement measure	Value	Interpretation
Cohen's kappa	0.935	Excellent agreement
Quadratic weighted kappa	0.967	Excellent agreement

Interobserver agreement was assessed using Cohen's kappa and quadratic weighted kappa

4. Discussion

The present study demonstrated that sagittal spinopelvic morphotypes were not evenly distributed among patients with LDH, with Roussouly type 3 being the most frequent subtype, followed by type 2. No significant association was observed between Roussouly morphotype and herniation level, whereas PI and SS differed significantly across morphotypes. In addition, interobserver agreement for Roussouly classification was excellent. Taken together, these findings suggest that the Roussouly system is both morphologically coherent and highly reproducible in patients with LDH [3,11].

The predominance of type 3 in the present cohort should not be overinterpreted as a disease-specific pattern. In the original Roussouly description, type 3 was the most common sagittal profile in asymptomatic individuals, and this distribution has been reproduced in later normative studies, including a young Turkish population [3,5,13]. Therefore, the high proportion of type 3 in our series likely reflects, at least in part, its baseline prevalence in the general population rather than a specific association with disc herniation. From a clinical and biomechanical perspective, the more informative observation may be the substantial

representation of type 1 and especially type 2 morphotypes.

This point is relevant because types 1 and 2 are characterized by a flatter sagittal profile, lower SS, and reduced lumbar lordosis, features that may alter load transfer across the lumbar spine [3,4]. In our cohort, these morphotypes were likewise associated with lower PI and SS values, whereas progressively higher values were observed in types 3 and 4. This internal consistency supports the validity of the classification in this patient group and suggests that flatter spinopelvic profiles may constitute a more relevant morphologic substrate for LDH than the simple predominance of type 3 would imply.

This interpretation is broadly aligned with the existing literature. Previous studies have shown that spinopelvic alignment affects lumbar biomechanics and may influence susceptibility to disc degeneration and herniation [1,2,6,7]. Chen et al. further suggested that different sagittal subtypes may exhibit distinct patterns of lumbar disc degeneration according to age and level [8], while Torrie et al. reported that lumbar spinal subtype may influence degenerative disc changes in young and middle-aged adults [9]. Collectively, these studies support the biological plausibility of a relationship between sagittal morphology and lumbar disc pathology, particularly in flatter alignment profiles.

Nevertheless, our findings do not support a clear association between Roussouly type and the exact level of disc herniation. This differs from the report by Chen et al., who found that L5-S1 herniation was more frequent in types 1 and 2, whereas L4-L5 herniation was more common in types 2 and 3 in a younger LDH population [10]. Importantly, our primary level-specific hypothesis was not confirmed, as no significant association was found between Roussouly type and herniation level in the present cohort. Such discrepancies may reflect differences in age, population characteristics, case mix, or analytical strategy. More importantly, they may indicate that sagittal morphotype is more strongly related to general vulnerability to LDH than to the specific segment at which herniation develops.

Another notable result was that PI and SS, but not PT, differed significantly across morphotypes. This finding is expected from a mechanistic standpoint. PI is a fixed morphologic parameter, and SS is closely linked to sacral orientation and lumbar lordosis; accordingly, both should vary across Roussouly subtypes if the classification is functioning as intended [3-5]. By contrast, PT is more sensitive to compensatory posture and functional adaptation, which may reduce its discriminatory value in a heterogeneous LDH cohort. The absence of a PT difference in the present study should therefore not be interpreted as contradictory to the classification framework.

A further strength of this study is the excellent interobserver reliability of Roussouly type assignment. Reproducibility is a prerequisite for the scientific and clinical utility of any imaging-based spinal classification [11]. The very high kappa values observed in our cohort indicate that the classification can be applied consistently by independent observers in patients with LDH, thereby strengthening confidence in the identified morphologic patterns and supporting its use in future clinical and research settings.

Several limitations should be considered. First, the retrospective cross-sectional design limits causal inference and introduces the possibility of selection bias. Second, the study was conducted at a single center, which may limit external generalizability. Third, although the overall sample size was adequate, some subgroups—particularly upper lumbar herniations and type 4 morphology—were relatively small, which may have reduced statistical power for subgroup comparisons. In addition, because no asymptomatic control group was included, the present study could not determine whether specific morphotypes were overrepresented relative to the general population. Despite these limitations, the study has notable strengths, including a relatively large LDH cohort, systematic assessment of spinopelvic parameters, independent morphotype classification, and formal reliability analysis.

5. Conclusions

In conclusion, sagittal spinopelvic morphotypes were not homogeneously distributed among patients with LDH. Although type 3 was the most common morphotype, this finding likely reflects its known predominance in asymptomatic populations. The notable representation of type 1 and especially type 2 morphotypes, both associated with lower PI and SS, suggests that flatter sagittal profiles may represent a potentially relevant morphologic pattern in LDH. The excellent interobserver reliability observed in this study further supports the Roussouly classification as a reproducible morphologic assessment tool in patients with LDH.

Conflicts of Interest. The authors declare no conflicts of interest.

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Availability of Data and Materials. The data used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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AI Disclosure. The authors declare that no generative AI or AI-assisted technologies were used in the preparation of this manuscript.

Ethics Approval and Consent to Participate. Ethics committee approval was obtained for this study. Informed consent was obtained from all patients included in the study.

Clinical Trial Number. Not Applicable.

Author Contributions. Conceptualization – A.C.B.; Data analysis – A.C.B., H.G.; Writing -original draft – A.C.B.; Writing - review and editing – A.C.B., H.G. All authors read and approved the final version of the manuscript.

References

1. Eren, B., Guzey, F. K., Gulec, I., Sahin, T., Tufan, A., & Bas, N. S. (2024). The Importance of Spinopelvic Parameters in Recurrent Lumbar Disk Herniation. Clinical Spine Surgery, 37(3), E113-E118. https://doi.org/10.1097/BSD.0000000000001546

2. Balza, R., & Palmer, W. E. (2023). Symptom-imaging correlation in lumbar spine pain. Skeletal Radiology, 52(10), 1901-1909. https://doi.org/10.1007/s00256-023-04305-8

3. Roussouly, P., Gollogly, S., Berthonnaud, E., & Dimnet, J. (2005). Classification of the normal variation in the sagittal alignment of the human lumbar spine and pelvis in the standing position. Spine, 30(3), 346–353. https://doi.org/10.1097/01.BRS.0000152379.54463.65

4. Roussouly, P., & Pinheiro-Franco, J. L. (2011). Biomechanical analysis of the spino-pelvic organization and adaptation in pathology. European Spine Journal, 20(Suppl 5), 609–618. https://doi.org/10.1007/s00586-011-1928-x

5. Laouissat, F., Sebaaly, A., Gehrchen, M., & Roussouly, P. (2018). Classification of normal sagittal spine alignment: Refounding the Roussouly classification. European Spine Journal, 27(8), 2002–2011. https://doi.org/10.1007/s00586-017-5111-x

6. Barrey, C., Jund, J., Noseda, O., & Roussouly, P. (2007). Sagittal balance of the pelvis-spine complex and lumbar degenerative diseases: A comparative study about 85 cases. European Spine Journal, 16(9), 1459–1467. https://doi.org/10.1007/s00586-006-0294-6

7. Menezes-Reis, R., Bonugli, G. P., Dalto, V. F., da Silva Herrero, C. F. P., Defino, H. L. A., & Nogueira-Barbosa, M. H. (2016). Association between lumbar spine sagittal alignment and L4–L5 disc degeneration among asymptomatic young adults. Spine, 41(18), E1081–E1087. https://doi.org/10.1097/BRS.0000000000001568

8. Chen, S. Q., Li, Q. P., Huang, Y. Y., Guo, A. N., Zhang, R. F., Ye, P. P., Yan, Z. H., & He, J. W. (2020). Different spinal subtypes with varying characteristics of lumbar disc degeneration at specific level with age: A study based on an asymptomatic population. Journal of Orthopaedic Surgery and Research, 15, 3. https://doi.org/10.1186/s13018-019-1537-7

9. Torrie, P. A. G., McKay, G., Byrne, R., Morris, S. A. C., & Harding, I. J. (2015). The influence of lumbar spinal subtype on lumbar intervertebral disc degeneration in young and middle-aged adults. Spine Deformity, 3(2), 172–179. https://doi.org/10.1016/j.jspd.2014.08.006

10. Chen, X., Shi, H. G., Wan, D., Deng, X. G., Song, S. M., & Cao, M. (2023). Relationship between lumbar disc herniation and Roussouly classification in the sagittal alignment of the spine and pelvis in young people. Quantitative Imaging in Medicine and Surgery, 13(7), 4687–4698. https://doi.org/10.21037/qims-22-503

11. Schwab, F., Ungar, B., Blondel, B., Buchowski, J., Coe, J., Deinlein, D., et al. (2012). Scoliosis Research Society–Schwab adult spinal deformity classification: A validation study. Spine, 37(12), 1077–1082. https://doi.org/10.1097/BRS.0b013e31823e15e2

12. Hajiahmadi, S., Shayganfar, A., Askari, M., & Ebrahimian, S. (2020). Interobserver and intraobserver variability in magnetic resonance imaging evaluation of patients with suspected disc herniation. Heliyon, 6(11). e05201. https://doi.org/10.1016/j.heliyon.2020.e05201

13. Aksekili, M. A. E., Asiltürk, M., Akçaalan, S., Aksekili, H., Alkan, H., & Demir, P. (2021). Radiological evaluation of normal sagittal vertebral, pelvis and global spinopelvic parameters in a young adult Turkish population. Journal of Turkish Spinal Surgery, 32(1), 20–25. https://doi.org/10.4274/jtss.galenos.2021.314

Бел дискісінің жарығының Руссули бойынша сагитталды жұлын-жамбас морфотиптері: Таралуы, жарықтың деңгейі және интер-бақылаушы сенімділігі

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Түйіндеме

Сагитталды жұлын-жамбас морфологиясы бел омыртқасының биомеханикалық ортасында маңызды рөл атқарады және бел дискісінің патологиясына бейімділікке әсер етуі мүмкін. Дегенмен, бел дискісінің жарығы (БДЖ) бар науқастарда Руссули морфотиптерінің таралуы туралы деректер шектеулі болып қала береді.

Зерттеудің мақсаты: БДЖ бар науқастарда Руссули жіктемесіне сәйкес сагитталды жұлын-жамбас морфотиптерінің таралуын бағалау, олардың жарықтың деңгейімен байланысын зерттеу және жіктеменің бақылаушылар арасындағы сенімділігін бағалау.

Әдістері. Бұл ретроспективті, көлденең қималы, бір орталықты зерттеуге БДЖ бар 256 науқас қатысты. Жасы, жынысы, дискі жарығының деңгейі, жамбас индексі/бұрышы (ЖИ), сегізкөз еңістігі (СЕ) және жамбас еңістігі (ЖЕ) көрсеткіштері тіркелді. Жарықтың деңгейлері L2–3, L3–4, L4–5 және L5–S1 болып жіктелді; салыстырмалы талдау үшін жоғарғы бел омыртқалары L2–3 және L3–4 қосымша анықталды. Сагитталды жұлын-жамбас сүйегінің морфологиясын екі тәуелсіз бақылаушы Руссули бойынша 1, 2, 3 немесе 4 типтері ретінде жіктеді. Руссули типі мен жарықтың деңгейі арасындағы байланыстар хи-квадрат сынағы арқылы талданды, ал жұлын-жамбас параметрлері морфотиптер арасында салыстырылды.

Нәтижелері. Ең көп таралған жарық деңгейі L4–5 (54,3%), содан кейін L5–S1 (32,4%) болды. Ең жиі кездесетін морфотип ретінде 3-ші тип (42,6%), содан кейін 2-ші тип (37,9%), 1-ші тип (13,7%) және 4-ші тип (5,9%) анықталды. Руссули типі мен жарықтың деңгейі арасында ешқандай маңызды байланыс табылған жоқ ($p = 0,220$). Керісінше, ЖИ және СЕ Руссули типтері арасында айтарлықтай ерекшеленді (екеуі де $p < 0,001$), ал ЖЕ ерекшеленбеді ($p = 0,341$). Руссули жіктемесі бойынша бақылаушылар арасындағы келісім өте жақсы болды: Коэн Каппа коэффициенті - 0,935, ал квадраттық салмақталған Каппа коэффициенті 0,967 болды.

Қорытынды. Сагитталды жұлын-жамбас морфотиптерінің омыртқааралық дискінің жарығы бар науқастардың арасында таралуы біркелкі емес. 3-ші тип ең көп таралған морфотип болғанымен, бұл оның симптомсыз популяцияларда жоғары таралуын көрсетеді. Әсіресе 1-ші және 2-ші морфотиптердің айтарлықтай көрініс беруі жалпақ сагитталды профильдердің омыртқааралық дискі жарығында маңызды морфологиялық паттерн болуы мүмкін екенін көрсетеді. Морфотип пен жарықтың деңгейі арасында ешқандай маңызды байланыс табылған жоқ. Руссули жіктемесі бұл когортада бақылаушылар арасындағы сенімділіктің жоғары екенін көрсетті.

Түйін сөздер: бел дискісінің жарығы, Руссули жіктемесі, сагитталды жұлын-жамбас тегістелуі, жамбас индексі/бұрышы, интер-бақылаушы сенімділігі.

Сагиттальные спинопельвикальные морфотипы Руссули у пациентов с грыжей поясничного диска: Распределение, уровень грыжи и межнаблюдательская надежность

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Резюме

Сагиттальная спинопельвикальная морфология играет важную роль в биомеханической среде поясничного отдела позвоночника и может влиять на предрасположенность к патологии поясничных дисков. Однако данные о распределении морфотипов Руссули у пациентов с грыжей поясничного диска (ГПД) остаются ограниченными.

Цель исследования: оценить распределение сагиттальных спинопельвикальных морфотипов согласно классификации Руссули у пациентов с ГПД, исследовать их взаимосвязь с уровнем грыжи и оценить межнаблюдательскую надежность классификации.

Методы. В данное ретроспективное поперечное одноцентровое исследование были включены 256 пациентов с ГПД. Были зарегистрированы возраст, пол, уровень грыжи диска, тазовый индекс/угол (ТИ), наклон крестца (НК) и тазовый наклон (ТН). Уровни грыжи были классифицированы как L2–3, L3–4, L4–5 и L5–S1; Для сравнительного анализа дополнительно были выделены верхнепоясничные позвонки L2–3 и L3–4. Сагиттальная спинопельвикальная морфология была классифицирована двумя независимыми наблюдателями как тип 1, 2, 3 или 4 по Руссули. Связи между типом по Руссули и уровнем грыжи анализировались с использованием критерия хи-квадрат, а спинопельвикальные параметры сравнивались между морфотипами.

Результаты. Наиболее распространенным уровнем грыжи был L4–5 (54,3%), за которым следовал L5–S1 (32,4%). Наиболее частым морфотипом был тип 3 (42,6%), за которым следовали тип 2 (37,9%), тип 1 (13,7%) и тип 4 (5,9%). Значимой связи между типом по Руссули и уровнем грыжи обнаружено не было ($p = 0,220$). Напротив, ТН и СН значительно различались между типами Руссули (оба $p < 0,001$), тогда как ТН не различался ($p = 0,341$). Согласованность между наблюдателями при классификации Руссули была превосходной, с коэффициентом Каппа Коэна 0,935 и квадратично-взвешенным коэффициентом Каппа 0,967.

Выводы. Сагиттальные спинопельвичкальные морфотипы были неравномерно распределены у пациентов с грыжей межпозвоночного диска. Хотя тип 3 был наиболее распространенным морфотипом, это, вероятно, отражает его высокую распространенность в бессимптомных популяциях. Заметное представительство морфотипов типа 1 и особенно типа 2 предполагает, что более плоские сагиттальные профили могут представлять собой потенциально значимый морфологический паттерн при грыже межпозвоночного диска. Значимой связи между морфотипом и уровнем грыжи обнаружено не было. Классификация Руссули продемонстрировала отличную межнаблюдательскую надежность в этой когорте.

Ключевые слова: грыжа поясничного диска, классификация Руссули, сагиттальное спинопельвикальное выравнивание, тазовый индекс/угол, межнаблюдательская надежность.