Avalaible online at https://journals.ums.ac.id/index.php/biomedika, Permalink/DOI: 10.23917/biomedika.v11i2.7628
Biomedika, ISSN 2085-8345

HUBUNGAN DERAJAT LUMBAR FORAMINAL STENOSIS PADA MRI SAGITTAL DENGAN JOABPEQ (JAPANESSE ORTHOPAEDIC ASSOCIATION BACKPAIN QUESTIONNAIRE) DAN ODI (OSWESTRY DISABILITY INDEX) PADA PASIEN STENOSIS FORAMINAL LUMBAR L5-S1

CORRELATION OF LUMBAR FORAMINAL STENOSIS DEGREE ON SAGITTAL MRI WITH JOABPEQ (JAPANESE ORTHOPAEDIC ASSOCIATION BACKPAIN QUESTIONNAIRE) AND ODI (OSWESTRY DISABILITY INDEX) ON LUMBAR FORAMINAL STENOSIS L5-S1 PATIENTS

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ABSTRAK

Lumbar Foraminal Stenosis (LFS) dapat secara signifikan mengurangi fungsi dan kualitas hidup pasien dan Magnetic Resonance Imaging (MRI) adalah alat pendukung yang umum digunakan untuk mengukur beratnya stenosis. Lee score umumnya digunakan untuk mengukur derajat LFS pada MRI sagital. Japanese Orthopaedic Association Back Pain Evaluation Questionnaire (JOABPEQ) dan Oswestry Disability Index (ODI) digunakan untuk menilai disabilitas dan skor fungsional pada pasien LFS. Penelitian ini bertujuan untuk mengetahui korelasi antara derajat LFS pada MRI sagital dengan kualitas hidup pada pasien dengan LFS. Penelitian ini merupakan penelitian analitik observasional yang melibatkan 25 pasien dengan gejala klinis LFS di RS. X Surakarta. Pasien dinilai dengan mengisi kuesioner JOABPEQ dan ODI, kemudian dilakukan evaluasi MRI sagittal lumbar untuk menentukan derajat Lee score, kemudian melakukan uji korelasi pada data yang diperoleh. Penelitian ini menunjukkan korelasi yang signifikan antara Skor Lee dengan JOABPEQ dan ODI. Tingkat LFS berdasarkan Lee Score memiliki korelasi yang signifikan dengan tingkat disabilitas menggunakan JOABPEQ dan ODI. JOABPEQ memiliki korelasi yang lebih signifikan dengan Skor Lee dibandingkan dengan ODI.

Kata Kunci : *Lumbar Foraminal Stenosis, Lee Score, JOABPEQ, ODI*

ABSTRACT

Lumbar Foraminal Stenosis (LFS) can significantly reduce the patient's function and quality of life and Magnetic Resonance Imaging (MRI) is commonly used supporting tool to measure the degree of stenosis. Lee Score is commonly used to measure the degree of LFS on sagittal MRI. Japanese Orthopaedic Association Back Pain Evaluation Questionnaire (JOABPEQ) and Oswestry Disability Index (ODI) to assess disability and functional scores in LFS patients. This study was conducted to determine the correlation between the degree of LFS on sagittal MRI images with quality of life in patients with LFS.This study is an observational analytics study involving 25 patients with clinical symptoms of LFS in X Hospital Surakarta. Patients were assessed by filling JOABPEQ dan ODI questionnaires, then performed sagittal lumbar MRI evaluation to determine the degree of Lee Score, then performed correlation test on the data obtained.This study shows a significant correlation between Lee Score with JOABPEQ and ODI. The degree of LFS based on Lee Score has a significant correlation with the degree of disability using JOABPEQ and ODI. JOABPEQ has a more significant correlation to Lee Score compared with ODI.

Keywords:*Lumbar Foraminal Stenosis, Lee Score, JOABPEQ, ODI*

How To Cite**:** Widhiarso, B., Yurisworo, A., Prijosedjati, A., Utomo, P., & Handojo, H. (2019). CORRELATION OF LUMBAR FORAMINAL STENOSIS DEGREE ON SAGITTAL MRI WITH JOABPEQ (JAPANESE ORTHOPAEDIC ASSOCIATION BACKPAIN QUESTIONNAIRE) AND ODI (OSWESTRY DISABILITY INDEX) ON LUMBAR FORAMINAL STENOSIS L5-S1 PATIENTS. Biomedika, 11(2), 68-73. doi:https://doi.org/10.23917/biomedika.v11i2.7628

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BACKGROUND

Lumbar foraminal stenosis (LFS) is a narrowing of the bony exit of the nerve root that caused by reduced of vertebral disc height, osteophytes at the vertebral endplate, facet joint arthritis, spondylolistesis, and disc herniation at one or several spinal level lumbar regions. LFS causes compression of exiting nerve root and ganglion, and also triggers lumbar radiculopathy. Like central canal stenosis, foraminal stenosis will worsen in the extension position (Herkowitz *et al.,* 2017). Typical symptoms of LFS include low back pain, resting leg pain, weakness, and symptoms of radiculopathy, which can significantly reduce the function and level of activity. The reported LFS incidence is 8% - 26% . LFS most often appears on the lumbar nerve root, with L5 nerve roots most common affected (75%) (Yamada *et al.* 2017). Magnetic resonance imaging (MRI) is commonly used to establish the diagnosis and degree of stenosis (Lee *et al.*, 2010).

Because the nerve root appears through the foramen, it is located adjacent to the superior facet end of the vertebra below it. When the intervertebral disc is narrowed, the posterior joint will overlap, and there may be pressure from the superior articular facet (Haldeman *et al.*, 2002).

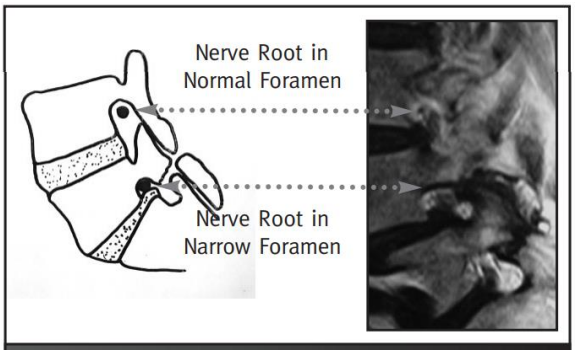

Figure 1. Nerve Root in Narrowed Foramen
(Shipley *et al.*, 2008)

MRI imaging, using sagittal and axial cuts, is the most informative investigation method, because it can show soft tissue and pathology in the bone, and allows direct assessment of the foramina, lateral recess and nerve roots. MRI allows multiple levels of examination with one investigation, without radiation or the risk of myelography, unlike CT. Various methods of radiological assessment have been suggested to assess spinal stenosis, but in reality there is a bad correlation between radiological examination and clinical symptoms that appear. Haig *et al* noted that spinal stenosis that was radiologically confirmed, but not accompanied by clinical symptoms, appeared in up to 85% of the older population (Attias *et al.* 2016, Yawara *et al.* 2016, Yamada *et al.* 2017, and Varghese and Babu., 2018).

Wildermuth *et al.* introduced a partial quantitative classification system to assess foraminal lumbar spine stenosis based on MRI imaging findings. They focused on the degree of epidural fat obliteration without considering direct compression of the nerve root (Park, *et al.* 2012). Lee *et al.* introduced a new grading system for foraminal stenosis of the lumbar spine. The scoring system considers the type of stenosis, the amount of fat obliteration, and the compression of nerve root. In this study we will use a scoring system from Lee *et al*. because the Lee *et al*. scoring system shows better clinical correlation than the Wildermuth system (Lee *et al*., 2010 and Park *et al*. 2012).

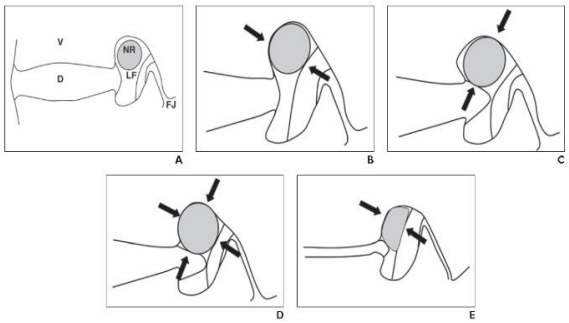

Figure 2. Description of the Degree of Foraminal Stenosis in sagittal MRI Based **on Lee *et al.*'s classification. A: Grade 0; B and C: Grade 1 (mild); D: Grade 2 (medium); E: Grade 3 (severe)** (Lee *et al*., 2010).

METHOD

This study was a cross-sectional study in 25 patients with LFS clinical symptoms. Patients were asked to fill in the JOABPEQ and ODI questionnaires, then to evaluate sagittal lumbar MRI to determine the degree of Lee Score, then test the correlation with the data obtained (Fukui *et al*. 2008, Lee *et al*. 2010, and Broadke *et al*. 2017).

This study was an Analytical Observational Research, with Cross Sectional review. The study was conducted at the X Hospital Surakarta. The study population was all patients treated at X Hospital Surakarta who complained symptoms of LFS. Samples were selected from these patients by random sampling that met the inclusion criteria, which are age ≥40 years and had complaints of LFS symptoms at least 1 month, with no history of trauma, infection, tumor, or other neuromuscular abnormalities of the spine.

Radiological data of lumbar sagittal MRI of these patients were taken from the Soft File Data Base in the Radiology Department X Hospital Surakarta. Assessment of the degree of stenosis based on sagittal T2 MRI image then adjusted to the Lee Score, expressed in grade 0, 1, 2, and 3. Data of disability degree of these patients was obtained by conducting interviews with patients using the JOABPEQ and ODI questionnaire.Furthermore, the data obtained were tested for normality using the Saphiro-Wilk Test and continued by

Spearman's non-parametric correlation analysis to determine the relationship between Lee Score and the quality of life *(level significance*: p<0.05).

RESULT AND DISCUSSION

In this study, the number of female samples was 14 (56%) and male patients were 11 (44%) with a mean age of sample (mean) of 53 years and an age range between 40 years and 86 years.

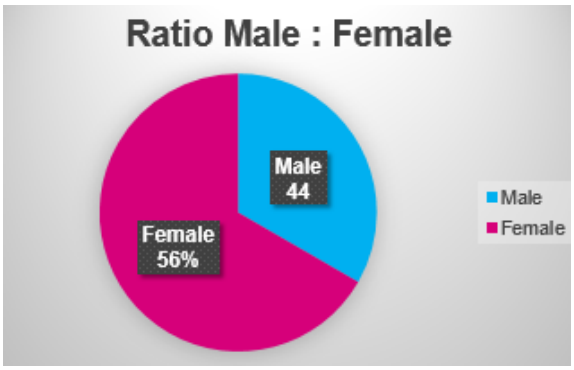

Figure 3. Data distribution based on the gender of the patients

Based on the distribution of patient data, the number of LFS patients with Lee Score Grade 1 (mild) was 9 people (36%), Grade B (moderate) was 7 people (28%) and C (severe) was 9 people (36%), as stated in the following diagram.

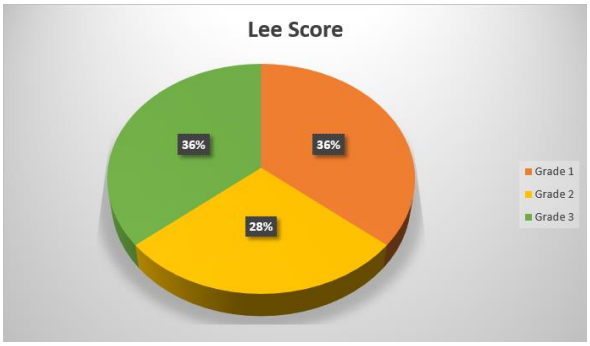

Figure 4. Data distribution patients based on the Lee Score grade

Figure 5. Example of patient's MRI grading based on Lee Score on our study

Table 1 shows that LFS has a significantly positive correlation with ODI (p = 0.000723). LFS also has a significantly negative correlation with the five JOABPEQ factors (p = 0.000916 for Low Back Pain (LBP) factor; p = 0.000944 for LF factor; p = 0.000879 for Walking Ability (WA) factor; p = 0.000930 for LSF factor; and 0 000897 for Mental Health (MH) factor). From these data it can be concluded that the higher the degree of foraminal stenosis, the higher the ODI score, and the lower the JOABPEQ score.

Table 1. Correlation Study of LFS with JOABPEQ and ODI on our Study

Correlation Variable	Correlation Coefficient	P value	Conclusion
LFS degree with ODI	0.723	0.00 (<0.05)	LFS has positive correlation with ODI significantly
LFS degree with LBP (JOABPEQ)	(-) 0.916	0.00 (<0.05)	LFS has negative correlation with LBP (JOABPEQ) significantly
LFS degree with LF (JOABPEQ)	(-) 0.944	0.00 (<0.05)	LFS has negative correlation with LF (JOABPEQ) significantly
LFS degree with WA (JOABPEQ)	(-) 0.879	0.00 (<0.05)	LFS has negative correlation with WA (JOABPEQ) significantly
LFS degree with SLF (JOABPEQ)	(-) 0.903	0.00 (<0.05)	LFS has negative correlation with SLF (JOABPEQ) significantly
LFS degree with MH (JOABPEQ)	(-) 0.897	0.00 (<0.05)	LFS has negative correlation with MH (JOABPEQ) significantly

LFS can appear in a mild degree to the most severe degree where total obliteration of perineural fat and nerve root compression has occurred (Yamada *et al*., 2014). In this study, we tested the correlation of degrees of maternal stenosis in sagittal MRI with JOABPEQ and ODI using SPSS 23 for Windows. Based on the correlation test, it was found that LFS correlated negatively with JOABPEQ significantly, and positively correlated with ODI significantly. The correlation coefficient for each JOABPEQ factor has a greater value than ODI, so it can be concluded that JOABPEQ has a correlation to the degree of final stenosis in sagittal MRI which is more significant than ODI. This is consistent with the initial hypothesis where there was an association between the radiological score (Lee score) and quality of life in lumbar foraminal stenosis patients, where based on Lee Score, JOABPEQ was better used to assess the quality of life of LFS patients compared to ODI.

There were several limitations of this study , including: a lack of samples, and not described the symptoms of LFS which most often appeared in the study sample.

CONCLUSIONS

The results of statistical data analysis, both those who assessed the correlation between Lee Score and the patient's life quality based on JOABPEQ and that assessed the correlation between Lee Score against degree of disability assessed by ODI, both of them obtained significant correlation results. From the statistical data it can also be assessed

that JOABPEQ has a more significant correlation to Lee Score compared with ODI. These results can be interpreted that the more severe of LFS degree will lead more disability and lower life quality of the LFS patients.

REFERENCES

Attias, N., Hayman, A., Hipp, J.A., Noble, P., *and* Esses, S.I. 2006. Assessment of MRI in the diagnosis of lumbar spine foraminal stenosis: a surgeon's perspective**.** J Spinal Discord Tech., 199(4):249-56.

Brodke, D.S., Goz, V., Lawrence, B.D., Spiker, W.R., Neese, A., *and* Hung, M. 2017. Oswestry Disabilty Index: a psychometric analysis with 1,610 patients. Spine J., 17(3) 321-7.

Fukui, M., Chiba, K., Kawakami, M., Kikuchi, S., Konno, S., Miyamoto, M., Seichi, A., Shimamura, T., Shirado, O., Taguchi, T., Takahashi, K., Takeshita, K., Tani, T., Toyama, Y., Wada, E., Yonenobu, K., Tanaka, T., *and* Hirota, Y. 2008. Japanese Orthopaedic Association Back Pain Evaluation Questionnaire. Part 3. Validity study and establishment of the measurement scale: Subcommittee on Low Back Pain and Cervical Myelopathy Evaluation of the Clinical Outcome Committee of the Japanese Orthopaedic Association, Japan.. J OrthopSci., 13(3):173-9.

Haldeman, S.D., Kirkaldy-Willis, W.H., Bernard, T.N., *and* Wilks, B. 2002. An Atlas of Back Pain. The Parthenon Publishing Group. London.

Herkowitz, H.N., Garfin, S.R., Eismont, F.J., Bell, G.R., *and* Balderston, R.A. 2017. Rothman – Simeone and Herkowitz's, The Spine, 7th Edition. Saunders.

Lee, S., Lee, J.W., Yeom, J.S., Kim, K.J., Kim, H.J., Chung, S.K., *and* Kang, H.S. 2010. A Practical MRI Grading System for Lumbar Foraminal Stenosis. American Journal of Roentgenology, 194 (4):1095-8.

Park, H.J., Kim, S.S., Lee, S.Y., Par, N.H., Rho, M.H., Hong, H.P., Kwag, H.J., Kook, S.H., *and* Choi, S.H. 2012. Clinical Correlation of a New MR Imaging Method for Assessing Lumbar Foraminal Stenosis. AJNR Am J Neuroradiol., 33(5): 818-22.

Shipley, J.A. 2008. Lumbar Spinal Stenosis. SA Orthopaedic Journal, 42-7.

Varghese, B., *and* Babu, A.C. 2018. New Magnetic Resonance Imaging System for Lumbar Neural Foramina Stenosis. International Journal of Anatomy, Radiology and Surgery, 7(1): 56-60.

Yamada, K., Aota, Y., Higashi, T., Ishida, K., Nimura, T., Konno, T., *and* Saito, T. 2014. Lumbar foraminal stenosis causes leg pain at rest. Eur Spine J., 23(3):504-7.

Yamada, K., Abe, Y., Satoh, S., Yanagibashi, Y., Hyakumachi, T., *and* Masuda, T. 2017. A novel diagnostic parameter, foraminal stenotic ratio using three-dimensional magnetic resonance imaging, as a discriminator for surgery in symptomatic lumbar foraminal stenosis. The Spine Journal., 17(8):1074-81

Yawara, E., Ohtori, S., Suzuki, M., Oikawa, Y., Yamanaka, H., Tamai, H., Kobayashi, T., Orita, S., Yamauchi, K., Suzuki, M., Aoki, Y., Watanabe, A., Kanamoto, H., *and* Takahashi, K. 2016. Diagnosis of Lumbar Foraminal Stenosis Using Diffusion Tensor Imaging. Asian Spine J., 10(1):164-9.