The Essence of Clinical Practice Guidelines for Lumbar Disc Herniation, 2021: 3. Diagnosis

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Diagnosis

Summary

The disease name "lumbar disc herniation" may be used without careful consideration by patients based on subjective symptoms and by healthcare professionals on the basis of imaging data. In reality, however, it is difficult to diagnose that "lumbar disc herniation is the cause of clinical disorders" based solely on clinical symptoms, such as radiating pain in the lower legs, or imaging findings, such as lumbar disc herniation (including intervertebral disc bulging) on MRI. Moreover, diagnosis of the affected levels and damaged nerve roots on the basis of only clinical findings is not very accurate. This is attributable to many factors, such as the presence of a wide variety of pathological conditions manifested as radiating pain in the lower legs, morphological varieties of lumbar disc herniation (with/without extrusion, localization), and frequent detection of asymptomatic intervertebral disc herniation, particularly in elderly patients because of advances in image analyzers, such as MRI. Therefore, lumbar disc herniation/damaged nerve roots should be diagnosed comprehensively based on medical interviews, physical findings, and diagnostic imaging.

Commentary

1. Symptoms of lumbar disc herniation

Obtaining information suggestive of lumbar disc herniation from medical interviews, including history taking, is critical to effectively conduct subsequent diagnostic procedures based on physical findings/diagnostic imaging.

1.1. Manifestation patterns/patient background/symptoms

The diagnostic accuracy using ROC curves of four past medical histories is 0.8, and the usefulness of history taking has been reported[1,2]. Similarly, the diagnostic accuracy with ROC curves including past medical history and patient background is 0.65[3]. Worsening of leg pain by coughing/sneezing/straining has also been reported to be a crucial symptom in medical history suggesting lumbar disc herniation[4].

1.2. Duration of symptoms

The duration of preoperative symptoms in lumbar disc herniation has been reported to be shorter than that in spinal canal stenosis[5]. The noncontained type (transligamentous extrusion and sequestration) is associated with a higher pain intensity and shorter duration of symptoms compared with the contained type (protrusion and subligamentous extrusion). Thus, another consideration is required on the differences in symptoms by types of lumbar disc herniation[6].

1.3. Characteristics of lumbar disc herniation in young patients

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Low back pain, severely limited trunk forward bending, tight hamstrings, and sciatic scoliosis are characteristic findings in young patients with lumbar disc herniation[7-9].

2. Clinical diagnosis of lumbar disc herniation

Diagnosing lumbar disc herniation is a process comprising the identification of nerve roots damaged by exposure to physical/chemical stimuli from the herniated disc and differentiation from other pathological conditions manifested as similar disorders. In the case of single-level radiculopathy, nerve root compression in the lumbar spine can be at the intraspinal canal at the level where the affected nerve root diverges or intra/extraforaminal at one level below, and the consistency among diagnostic findings, including medical history/physical examination and imaging findings, such as MRI should be verified. In MRI-based diagnosis, the prevalence of asymptomatic lumbar disc herniation (bulging) is high, and dependence on diagnostic imaging alone should be avoided[10].

2.1. Diagnostic accuracy of various tests/physical examination

Pain provocation test

The straight leg raising test (SLRT) is highly positive, particularly in young patients with lumbar disc herniation. The test has been shown to be useful for the diagnosis of lumbar disc herniation. However, the specificity was reported to be low (sensitivity 0.35-0.97, specificity 0.10-1.00)[11]. This may be attributable to the differences in the definition of a positive test result between the reports, presence of various spinal diseases that can cause nerve root compression, and lack of standardization of terms. In contrast, the femoral nerve stretching test and crossed SLRT have been reported to have high specificity, albeit low sensitivity[11].

Muscle weakness/sensory disturbance

Regarding the diagnostic accuracy of muscle weakness, the specificity has been reported to be moderate in patients with severe paralysis, albeit the sensitivity is low. In contrast, regarding the diagnostic accuracy of sensory disturbance, several reports have shown that both sensitivity and specificity are low[11-15].

Absent/diminished deep tendon reflex

Patients are considered positive for L4 radiculopathy and S1 radiculopathy if the patellar tendon reflex and Achilles tendon reflex is diminished or absent, respectively; however, both of them have been reported to have low diagnostic accuracy[11-15].

Pain radiation area (patient-reported)

Some reports have concluded that the distribution of radiating pain is diagnostically useful[16]. Meanwhile, this information is not useful for differential diagnosis between L5 and S1 radiculopathy[17].

2.2. Comprehensive diagnosis with medical history and various physical findings

The diagnostic accuracy is improved by the combined use of medical history and various examinations in a comprehensive manner since each of the diagnostic procedures has a low diagnostic accuracy for lumbar disc herniation when used alone[11-14].

3. Diagnostic imaging for lumbar disc herniation (plane radiography, MRI, CT, including diagnostic value and necessity)

While MRI is the first-line imaging procedure, myelography or CT can be used as an alternative in patients for whom MRI cannot be used. For special pathological conditions, imaging procedures appropriate for a condition of interest should be performed. A systematic review has concluded that CT, myelography, and MRI have comparable diagnostic accuracies as follows: CT (nine studies), mean diagnostic rate 72%; myelography (eight studies), mean diagnostic rate 69.2%; and MRI (six studies), mean diagnostic rate 68.9%[18].

3.1. MRI

An analysis of preoperative MRI for the subligamentous and transligamentous types has shown that the sensitivity, specificity, and accuracy of morphological diagnosis were all ～76% when significant findings were used in combination[19]. MRI used to differentiate the contained and noncontained types showed sensitivity, specificity, and accuracy of 72%, 68%, and 70%, respectively[20]. The inter-rater reliability of MRI was not high[21,22]. Moreover, MRI detects asymptomatic lumbar disc herniation[23]. Recently, the usefulness of MRI in the sitting position and dynamic MRI for diagnostic imaging have been reported[24,25].

3.2. CT

In a systematic review studying the accuracy of CT-based diagnosis of lumbar disc herniation, the sensitivity and specificity were found to be 77.4% and 73.7%, respectively[26].

Among patients who underwent surgery, MRI and CT were used for diagnostic imaging; there were no differences between CT and MRI in the diagnostic accuracy of lumbar disc extrusion[27]. Myelography followed by CT was reported to be advantageous and useful for patients who could not undergo MRI[28].

3.3. Plain radiography

Plain radiography has significance when the clinical course and clinical symptoms suggest other nondegenerative pathology.

4. Auxiliary diagnosis for identification of affected levels/ nerve roots and significance thereof

No single auxiliary diagnostic procedure can perform the level diagnosis nor identify the damaged nerve root independently with a high diagnostic accuracy; however, selective nerve root block is useful when damaged nerve roots cannot be determined. Imaging procedures and electrophysiological investigations should be combined with past medical history and physical examinations for comprehensive diagnosis.

4.1. Neurophysiological investigations

Neurophysiological investigations alone showed low sensitivity and specificity in the diagnosis of damaged nerve roots[29]. The combined use of MRI and neurophysiological investigations was effective for the diagnosis of damaged nerve roots[30].

4.2. MRI

Diffusion tensor imaging analysis was used to quantitatively evaluate nerve root damage due to lumbar disc herniation and may have the potential to visualize microstructural changes in compressed nerve roots[31-33].

4.3. Selective nerve root block

Although no reliable reports are available on the diagnostic accuracy of selective nerve root block, this method is useful when the damaged nerve roots cannot be determined otherwise[34,35].

Conclusions

No single diagnostic technology or method has sufficient sensitivity and specificity for independent and direct diagnosis of lumbar disc herniation. Therefore, integrated decision-making based on relevant data/information, such as proper medical interviews, patient background, physical findings, and imaging findings, in a comprehensive manner is critical for diagnosis.

Conflicts of Interest: The authors declare that there are no relevant conflicts of interest.

The original version of these clinical practice guidelines appeared in Japanese as Yotsui Tsuikanban Hernia Shinryo Guidelines 2021, and its translated version in English was published in the Journal of Orthopaedic Science: Japanese Orthopaedic Association (JOA) clinical practice guidelines on the management of lumbar disc herniation, third edition. 2022;27(1): 31-78.

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