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Research Article

Modified Omar Sign for the Clinical Diagnosis of Unilateral Foraminal Stenosis Associated with Disc Prolapse

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ABSTRACT

Objective and study design: A retrospective study analyses the validity of the Modified Omar's test for the clinical diagnosis of unilateral lumbar foraminal stenosis associated with disc prolapse.

Methods: This study analyses 250 patients with unilateral sciatic pain, between 2011 and 2020. All the data was obtained from the database collected from our institution and our private clinics. All patients had a standardized neurological assessment with applying the modified Omar test during their examination, then comparing the clinical findings with the MRI imaging. The postoperative clinical finding's looking for absence of modified omar sign were also compared to the preoperative one.

Results: The modified Omar test was applied during the physical examination. The test was positive for all selected patients with positive unilateral lumbar disc prolapse with foraminal stenosis in MRI finding at the same side of the sign. Comparing the clinical finding preoperative and after surgical intervention or after nerve root block the test was negative which is a sure sign for availability of the test.

Conclusion: The modified Omar test is a clinical test applied during the neurological examination for diagnosis of lumbar foraminal stenosis. The correlation between clinical and radiological findings confirms the test availability with absence of Omar sign after surgical intervention, and after nerve root block. The test is sensitive and more reliable diagnostic tool for the clinical diagnosis of foraminal stenosis and for the clinical follow-up after surgical intervention.

Keywords: Clinical test; Diagnosis; Nerve root compression; Modified Omar test; Foraminal stenosis sign

Abbreviations: MRI: Magnetic Resonance Imaging; CT: Computerized Tomography; SAP: Superior Articular Process; DRG: Dorsal Root Ganglia; DDD: Degenerative Disc Disease.

INTRODUCTION

Lumbar disc herniation is one of the most common medical and surgical problems all over the world. The natural history of the Degenerative Disc Disease (DDD) is unknown and the lifetime prevalence of symptomatic lumbar disc herniation in the adult population is approximately 2%. The annular degeneration leads to weakening of the annulus fibrosus, leaving the disc susceptible to annular fissuring, and tearing [1,2]. Among patients with radiculopathy secondary to lumbar disc herniation, 10%–25% experience a persistent symptom where the L4–L5 and L5–S1 levels are the most common sites (90%). The L3–L4 level is the next most common level [3].

Most lumbosacral radiculopathies are due to paracentral, lateral, and foraminal disc herniations that are diagnosed by Magnetic Resonance Imaging (MRI). A correct first clinical diagnosis of nerve root compression is highly desirable for both physicians and patients, with proper management decisions based on the clinical findings corroborated by diagnostic radiological findings [4-6].

METHODOLOGY

It is a retrospective study analyzing the validity of Modified Omar's test for the diagnosis of unilateral lumbar foraminal stenosis associated with disc prolapse. The study analyzed 250 patients having unilateral sciatic pain, between 2011 and 2020. The data were obtained from the database collected in our institution and

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our private clinics. Where the study involved 180 male patient and 70 female patients their ages ranged from 20 to 60 years old with all patients had a standardized neurological assessment.

Lumbar foraminal neuropathy is a pathologic condition of the neurovascular contents in the foramen causing radicular symptoms, which are associated with a narrowed foramen [7]. Anatomically, the foraminal stenosis may be anteroposterior (transverse), craniocaudal (vertical), or circumferential. The anteroposterior stenosis results from the Superior Articular Process (SAP) and posterior vertebral body transversely, and the craniocaudal stenosis results from osteophytes of the posterolateral vertebral endplate and a laterally bulging or herniated disc compressing the nerve root against the superior pedicle vertically [8].

Dynamic foraminal stenosis implies position-dependent provocation of foraminal volume with intermittent lumbar extension-provoked nerve root impingement [9]. This study involved 250 patients having foraminal stenosis due to disc prolapse with standardized clinical assessment followed by Magnetic Resonance Imaging (MRI).

Test method

The modified omar test was applied during the physical examination for all patients who presented to our neurosurgical outpatient clinic with unilateral lower limb radicular pain with or without back pain. The aim was to detect the presence or absence of this newly discovered sign (Omar sign) for the proper clinical diagnosis of foraminal stenosis.

Selection criteria

The test was performed on all patients having unilateral acute or chronic lower limb radicular pain, with the exclusion of all patients having lower back pain only, patients with scoliosis deformity, multilevel canal stenosis, multilevel facet arthropathy, earlier spinal surgery, spinal tumors, or spinal infection.

The test was positive for the patients with foraminal stenosis for other causes than disc prolapse as facet joint arthropathy, osteophyte formation, and ligament hypertrophy, but all those patients were excluded from this study for two reasons the first one is to check the efficacy of the test in a single selective lesion, the second reason is to investigate the other causes of foraminal stenosis other than disc prolapse in separate research.

Reference standards

The test was applied during the physical examination for all patients. The clinical findings were compared to the findings obtained from Magnetic Resonance Imaging (MRI) of the lumbar spine and to the clinical findings after surgery and after nerve root block.

Test description

Prior to starting the test, the patients were instructed to describe the pain distribution and location along her/his lower limb and if it is associated with numbness or tingling sensations during the test and after finishing from the test.

In a standing position with a straight spine and a neutral hip joint position, the palm of the examiner left hand is placed on the front of the lower abdomen for supporting. While the thumb of the right-hand pushes against the spinous process and the interspinous space from back forward for about 10 seconds. The patients during the test were instructed to hold their breath, and to describe the character of the pain, its distribution, its intensity, and the other associations. After 5 seconds from releasing the pressure from the spinous process and the lower abdominal wall the patients were asked to describe if they still have the same pain or decreased in intensity. The same technique was performed with asking the patients to cough, bending forward, and bending backward for detection the prevalence of the test in a various direction. The test was positive in both directions, but it was more dependable and reliable when the patient was standing in a straight position. Coughing, sneezing, or straining may aggravate the testing effect (Figure 1).

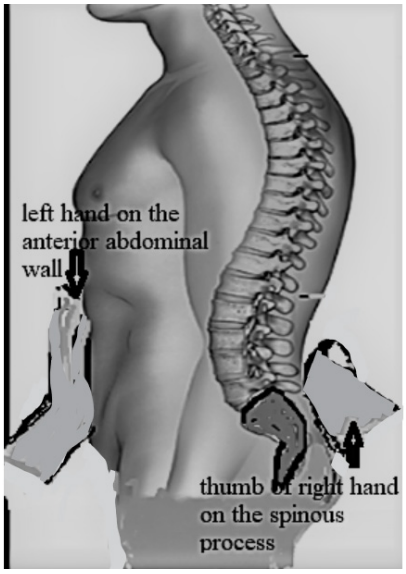

Figure 1: An illustration describes the technique of the test: in a standing position with the patient holding his breath. The examiner left palm of the hand presses against the patient anterior abdominal wall, and the thumb of the right-hand presses against the spinous process from the back.

Theoretical explanation of the test

In unilateral foraminal stenosis cases, as with disc prolapse, the nerve root is overly sensitive to any movement of the spine, especially during walking or bending. In a standing position with a straight spine, pushing the spinous process and the interspinous space anteriorly against the anterior abdominal wall leads to movement and compression of the posterior foraminal parts against its anterior parts, causing more narrowing of the intervertebral foramen and more compression of the nerve root especially with disc prolapse or with other causes of foraminal stenosis This leads to increase the radicular pain sensation, which could be due to direct mechanical narrowing of the intervertebral foramen with more nerve root compression lead to nerve root signal transmission interruption. When the patient bends forward more compression forces is needed due to back muscles and ligaments over stretching.

RESULTS

Degenerative narrowing of the lumbar foramen is a gradual process. However, it is understood that foraminal narrowing increases the risk of developing radicular pain and root compression. The patients can remain asymptomatic or experience only mild discomfort if there is no foraminal stenosis, but if the patient has

foraminal stenosis with an inflamed nerve, the pain developed. The symptoms progress within a brief time and the most common symptoms are pain radiating down the leg, tingling sensation, and numbness during standing or walking.

During the physical examination, the straight leg raising test and the femoral nerve stretching test are usually non-specific for foraminal stenosis. Therefore, the idea of the modified Omar test and the Omar sign developed for proper clinical diagnosis of nerve root compression and foraminal stenosis.

During the physical examination, all patients showed positive tests with radiating pain along the course of nerve root supply at the following levels L5-S1, L4-L5, L3-L4, and L2-L3.

At L1-L2 level the result was less significant may be due to wide foramen, or less foraminal movement during the test, with small size dorsal root ganglia in comparison to lower lumbar levels, so all patients having L1-2 discs with foraminal stenosis were excluded from this research. The radiating leg pain explained by the patients during the test follows the course of the affected nerve root in the MRI findings with all patients (250 patients, 100%).

Bed rest, nonsteroidal anti-inflammatory drugs, and physiotherapy started after clinical and radiological diagnosis for about 2 to 3 months. Few patients had microdiscectomy before this time. The exact time for doing surgery or doing nerve root block was variable depending on the response of the patients to the medical treatment. 160 (64%) patients from the 250 patients underwent minimally invasive surgery, (unilateral laminectomy or laminotomy with microdiscectomy). Seventy patients (28%) underwent nerve root block with the improvement of the radicular pain for few weeks or months, then a recurrence of the pain and underwent surgical microdiscectomy. Twenty patients (8%) were refusing surgery because they were afraid of having surgery, so they underwent repeated steroid injections (Figure 2).

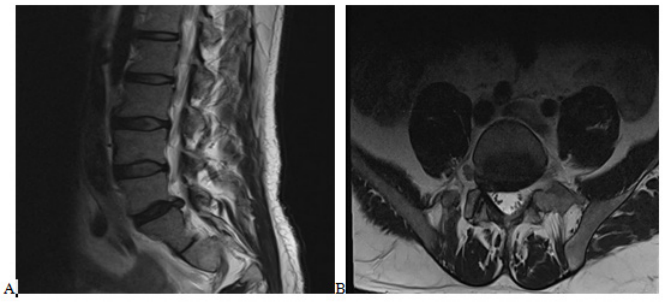

Figure 2: MRI lumbar spine sagittal and axial views of a patient with right L5-S1 radicular pain for three weeks, and positive Omar sign during the physical examination. The MRI lumbar spine shows right L5-S1 moderate broad-based paracentral disc herniation impingement of the right neural foramen. The patient underwent a nerve root block with dramatic improvement of his leg pain, after two months, he had a recurrence of leg pain. Then he recommended having surgery (Minimal Invasive Microdiscectomy) and after surgery, he had a dramatic improvement in his leg pain for 12 months of follow-up with a negative Omar sign during his clinical examination.

All patients were seen after surgery, and after nerve root block in an outpatient neurosurgical clinic for 1, 2, 3, 6, 9, and 12 months, searching for the Omar sign during their clinical examinations. The test was negative after surgery and after nerve root block for all patients (100%) during the period of follow-up. The most common level in this study were L5-S1 (161 (64.4%)) patients, L4-L5 level (78 (31.2%) patients, L3-4 level 9 (3.6%)) patients, and L2-3 level 2 (0.8%) patients (Table 1).

Table 1: It is showing the results of the clinical findings before and after surgical intervention, and MRI findings for the whole patient.

Level of stenosis	L5-S1	L4-L5	L3-L4	L2-L3
Number of cases	161	78	9	2
Modified omar sign before intervention	100% positive	100% positive	100% positive	100% positive
Modified omar sign after surgery and after nerve root block	100% negative	100% negative	100% negative	100% negative
Period of follow up	1, 2, 3 ,6 ,9 ,12 months			
MRI finding preoperative	All cases were positive for foraminal stenosis with disc prolapse			

DISCUSSION

Acquired foraminal stenosis is found secondary to degenerative changes in the spine, such as hypertrophy of the facet joint, ligament, bone, disc disorders, and osteophyte formation [10]. The normal intervertebral foramen has a teardrop-like shape, and its form changes significantly in flexion-extension motions as well as in lateral-bending and axial rotation [11]. The foraminal height in the lumbar spine ranges between 19 and 21 mm and the superior-inferior sagittal diameter ranges between 7 and 8 mm. (3-4 mm in diameter considered foraminal stenosis). Instead of measuring the dimensions, Wildermuth, et al. introduced a qualitative scoring system for foraminal stenosis [12]. Whoever's direct measurement of the bony canal on a radiographic image does not supply a correct assessment of the degree of stenosis.

Back pain and radicular pain can originate from different anatomic structures within the spine, making it difficult for the patient and the physician to localize. Localization of the anatomical pain generator in patients with leg pain is important for clinical diagnosis, and for surgical planning, and follow-up [13]. The incidence of foraminal stenosis and nerve root impingement increases in the lower lumbar levels due to the increased diameter of the Dorsal Root Ganglia (DRG) and the commonly involved nerves are the fifth lumbar nerve root (75%), the fourth nerve root (15%), the third nerve root (5.3%), and the second nerve root (4%) respectively [14].

The sensory nerve root elicits nociceptive pain that includes deep aching and throbbing with heaviness and a squeezing sensation associated with tingling and numbness. As the DRG becomes inflamed and entrapped in the foramen, the pain changes to neuropathic pain, which is characterized by sharp, shooting, burning, stabbing, and lancinating sensations, and may become intolerable [15,16].

Boden, et al. noted abnormal findings in 57% of asymptomatic patients on Magnetic Resonance Imaging (MRI) scans [17]. Ishimoto, et al. reported that 9.9% of the patients with moderate radiographic stenosis obliterating one-third to two-thirds of the spinal canal showed symptoms and 17.5% of the patients with severe radiographic stenosis obliterating more than two-thirds of the spinal canal had symptoms, so the diagnosis of the foraminal stenosis is not based solely on the radiographic findings [18]. Therefore, the clinical examination must include a specific test for the proper diagnosis of foraminal stenosis.

Looking through the literature, which proved the movement of the facet joint against the nerve root and the movement of anterior

parts of the intervertebral foramen against its posterior part in normal patients, give me the idea of the test. So, the proposal for the Omar test and sign was developed and was published in a local journal in 2015. After that, the modification is added to the test in this research to increase its specificity and selectivity, such as holding the patient's breath, an upright straight position, and the duration of performing the test from 5 to 10 seconds [19]. The amount of movement seen at the intervertebral foramen is consistent throughout the literature. While Goddard and Reid described an average movement of four millimetres at the intervertebral foramen [20]. This range of movement is out of the scope of this research.

The systematic reviews showed that the physical tests known for diagnosis of disc prolapse had poor specificity and low sensitivity, but no research was mentioned in the literatures for the clinical diagnosis of foraminal stenosis. This study (the modified Omar test and sign) shows high sensitivity (100%) of the test for the diagnosis of foraminal stenosis, but variable selectivity for specific nerve root compression (70%-80%) this variable specificity is due to the non-educated patients involved in this research, and the associated symptoms from other various sources such as sacroiliac joint pain and hip joint pain.

CONCLUSION

The modified Omar test is a clinical test applied during the neurological examination for diagnosis of lumbar foraminal stenosis. The correlation between clinical and radiological findings confirms the test availability with absence of Omar sign after surgical intervention, and after nerve root block. The test is sensitive and more reliable diagnostic tool for the clinical diagnosis of foraminal stenosis and for the clinical follow-up after surgical intervention.

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CONFLICT OF INTEREST

There is no conflict of interest.

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