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Posterior Disc Herniation with Thecal Sac Effacement: A Review of Epidemiology, Pathophysiology, Diagnosis and Management

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Abstract
Posterior disc herniation with thecal sac effacement is a degenerative spinal condition involving posterior displacement of intervertebral disc material into the spinal canal, causing compression of neural structures and neurological symptoms. Lumbar disc herniation is a leading cause of chronic low back pain worldwide, affecting 1–3% of adults. In Nigeria, the prevalence of low back pain ranges from 32.5% to 73.5%, particularly among individuals exposed to occupational strain and poor ergonomic practices. Major risk factors include aging, obesity, trauma, smoking, and repetitive spinal stress. Diagnosis relies on clinical evaluation and magnetic resonance imaging. Management involves conservative therapy and surgical intervention in severe cases. Early recognition and preventive strategies are essential for reducing disease burden and improving patient quality of life.

Keywords: Posterior Disc Herniation, Thecal Sac Effacement, Epidemiology, Pathophysiology, Diagnosis, Management.

Introduction

Posterior disc herniation with thecal sac effacement is a significant degenerative spinal disorder characterized by posterior displacement of intervertebral disc material into the spinal canal with subsequent compression of neural structures. Intervertebral discs function as fibrocartilaginous cushions located between vertebral bodies, providing flexibility, load distribution, and shock absorption within the spinal column. Structurally, the disc consists of an outer fibrous ring known as the annulus fibrosus and a gelatinous inner component referred to as the nucleus pulposus [1,2].

Disc herniation occurs when structural weakening or rupture of the annulus fibrosus allows extrusion or protrusion of the nucleus pulposus beyond its anatomical boundaries. Posterior disc herniation is clinically important because of its proximity to the spinal canal, where it may compress the spinal cord, nerve roots, or thecal sac. The thecal sac is a protective dural sheath containing cerebrospinal fluid and neural elements. Effacement of the thecal sac occurs when external compression alters its normal contour, potentially resulting in neurological impairment [3,4,]. Posterior lumbar disc herniation is among the most common causes of low back pain and radiculopathy worldwide. The condition is associated with significant morbidity, decreased productivity, and increased healthcare costs. Increasing urbanization, sedentary lifestyles, and occupational hazards have contributed to the rising prevalence of degenerative spinal disorders globally and particularly in developing countries [3].

Prevalence

Lumbar disc herniation represents one of the leading causes of chronic low back pain globally. Epidemiological studies indicate that approximately 60–80% of adults experience low back pain at some point during their lifetime, with disc

herniation being a major underlying pathological cause [3]. The overall prevalence of symptomatic herniated nucleus pulposus is estimated to range between 1% and 3% of the general population, with peak incidence occurring among individuals aged 30 to 50 years [3].

Lumbar disc herniation most frequently affects the L4–L5 and L5–S1 spinal segments due to increased mechanical stress and mobility at these levels [2]. Several studies have also reported that males are slightly more affected than females, although recent reports suggest narrowing gender differences due to lifestyle and occupational exposures [1].

Prevalence in Nigeria

In Nigeria, spinal degenerative disorders are increasingly recognized as major contributors to musculoskeletal morbidity. Low back pain is highly prevalent across different occupational and demographic groups. Population-based studies have reported a twelve-month prevalence of low back pain ranging between 32.5% and 73.5% among Nigerian populations [5]. Magnetic resonance imaging studies conducted in Nigeria have shown that intervertebral disc herniation accounts for approximately 18.9% of spinal imaging abnormalities [6]. The increasing burden of disc herniation in Nigeria has been attributed to occupational risk factors, poor ergonomic practices, limited awareness of preventive measures, and delayed access to diagnostic imaging facilities [6,7].

Prevalence in South-Eastern Nigeria

Studies conducted in South-Eastern Nigeria have demonstrated a high prevalence of lumbar disc herniation among middle-aged and elderly populations. Research findings indicate that the condition is most common among individuals aged between 51 and 60 years. Multilevel disc involvement has also been frequently reported in this region [6,7].

Occupational exposure plays a significant role in disease prevalence within South-Eastern Nigeria. Traders, artisans, farmers, and manual laborers are particularly vulnerable due to repetitive lifting, prolonged standing, and poor posture during occupational activities [6,7]. These findings highlight the need for targeted occupational health interventions and preventive education within the region.

Causes

Posterior disc herniation primarily results from structural degeneration of intervertebral discs. Age-related degenerative changes represent the most common cause. Progressive dehydration of the nucleus pulposus reduces disc elasticity and increases susceptibility to rupture under mechanical stress [9,10]. Traumatic injury is another important cause of disc herniation. Sudden excessive force applied to the spine, such as during falls or motor vehicle accidents, may lead to tearing of the annulus fibrosus and extrusion of disc material [11,12] Repetitive mechanical stress also contributes significantly to disc degeneration. Occupational activities involving frequent bending, twisting, lifting, or prolonged sitting increase cumulative spinal strain and accelerate disc deterioration [13].

Congenital spinal abnormalities, including narrow spinal canal and vertebral structural variations, may predispose individuals to symptomatic disc herniation by reducing available space for neural structures [12]. Recent research has also highlighted the role of biochemical and inflammatory mechanisms in disc degeneration. Herniated disc material releases inflammatory mediators such as cytokines and proteolytic enzymes, which contribute to nerve root irritation and neuropathic pain [9].

Risk Factors

Multiple biological, occupational, and lifestyle factors contribute to the development of posterior disc herniation. Advancing age remains the strongest predictor of disc degeneration. Aging leads to reduced disc hydration, decreased vascular supply, and loss of structural integrity (6). Obesity significantly increases axial loading on the spine, accelerating degenerative changes [1]. Metabolic disorders such as diabetes mellitus and hyperlipidemia have also been associated with impaired disc nutrition and accelerated degeneration [5]. Smoking is an established risk factor for disc herniation. Nicotine reduces blood supply to spinal tissues and promotes disc dehydration, thereby increasing susceptibility to structural damage [5]. Genetic predisposition has recently been recognized as a contributing factor, with studies demonstrating associations between collagen gene polymorphisms and disc degeneration [6].

Occupational and Lifestyle Risk Factors

Occupational exposure remains a major contributor to disc herniation, particularly in developing countries. Heavy lifting, repetitive spinal movements, prolonged sitting, and poor ergonomic posture are commonly associated with increased disease risk [7,8]. Sedentary lifestyle and reduced physical activity contribute to weakened spinal musculature and reduced spinal support. Previous spinal injury also increases the likelihood of subsequent disc herniation [14].

Diagnosis

Diagnosis of posterior disc herniation with thecal sac effacement involves integration of clinical evaluation and radiological imaging. Patients commonly present with low back pain radiating to the lower extremities, often described as sciatica. Additional symptoms may include numbness, tingling sensations, muscle weakness, and reduced mobility [4,14]. Severe neural compression may result in bowel or bladder dysfunction, which constitutes a neurosurgical emergency [15,16]. Physical examination findings often include spinal tenderness, reduced range of motion, positive straight leg raising test, and neurological deficits corresponding to affected nerve roots [4,15].

Imaging Modalities

Magnetic resonance imaging remains the gold standard for diagnosing disc herniation. MRI provides detailed visualization of disc morphology, nerve root compression, and degree of thecal sac effacement [9,14]. The modality is highly sensitive and specific in detecting soft tissue abnormalities. Computed tomography and plain radiography may provide supplementary information regarding bony structures and degenerative changes but are less sensitive in evaluating soft tissue involvement (15,16]. Electrophysiological studies such as electromyography and nerve conduction studies may assist in evaluating nerve root involvement and severity of neurological impairment [8,15].

Treatment

Management of posterior disc herniation depends on severity of symptoms, degree of neural compression, and patient characteristics.

Conservative therapy represents the first-line treatment approach for most patients. Pharmacological therapy includes administration of analgesics, non-steroidal anti-inflammatory drugs, and muscle relaxants to reduce pain and inflammation [17,18,19]. Physiotherapy plays a critical role in strengthening spinal musculature, improving posture, and enhancing mobility [20.21.23]. Lifestyle modification including weight control, ergonomic adjustments, and avoidance of heavy lifting is essential in preventing disease progression. Epidural steroid injections may provide short-term symptom relief by reducing inflammatory processes around compressed nerve roots [5,22,23].

Surgical intervention is indicated in patients with persistent symptoms despite conservative therapy or in those with progressive neurological deficits. Common surgical procedures include microdiscectomy, laminectomy, and spinal fusion [6,23,24].

Advances in minimally invasive spine surgery have improved surgical outcomes, reduced postoperative complications, and shortened recovery time [24].

Conclusion

Posterior disc herniation with thecal sac effacement represents a major cause of chronic low back pain and neurological dysfunction worldwide. The condition is increasingly prevalent in Nigeria and South-Eastern Nigeria due to occupational hazards, aging population, and lifestyle changes (3–5). Early recognition of symptoms, prompt diagnostic imaging, and appropriate therapeutic intervention are essential in preventing long-term neurological complications. Conservative management remains effective in the majority of cases, while surgical intervention provides significant symptom relief in selected patients [22]. Strengthening occupational health education, improving access to diagnostic imaging, and promoting preventive lifestyle modifications are essential strategies in reducing disease burden.

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