# COILS

Clinical Osteopathically Integrated Learning Scenarios

## Patient with
# Degenerative Disc Disease

Prepared by: AACOM's Educational Council on Osteopathic Principles

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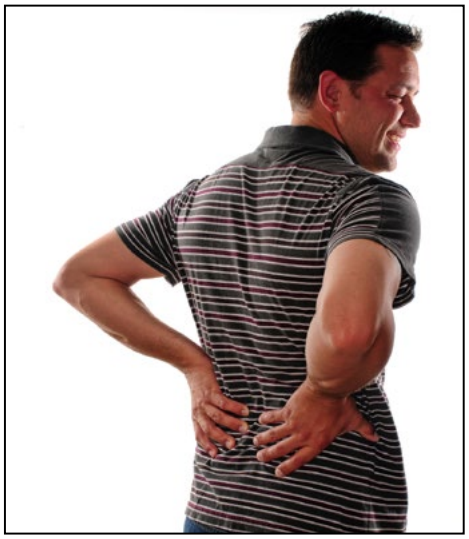
AMERICAN ASSOCIATION OF COLLEGES OF OSTEOPATHIC MEDICINE

Part 2: Chapter 2

**Musculoskeletal Clinical Osteopathically Integrated Learning Scenario:**

# Patient With Degenerative Disc Disease



## Description

This Clinical Osteopathically Integrated Learning Scenario (COILS) focuses primarily on the palpatory evaluation and supportive osteopathic manipulative treatment for a patient with degenerative disc disease.

The COILS is divided into two sections:

### Section One

The **Roundtable Discussion Workshop** includes a discussion and evaluation of the patient's case history, diagnosis, pathophysiology, osteopathic principles involved, functional anatomy, treatment options, contraindications, and (if time permits) a demonstration of manipulative treatment techniques applicable to the patient's homeostatic needs.

### Section Two

The **Patient-Based Application Workshop** is the supervised application of manipulative treatment techniques for a patient with this diagnosis. The workshop is designed to evaluate the student's or physician's diagnostic and psychomotor skills when providing an osteopathic manipulative treatment for an actual (or simulated) patient.

*If time permits, the instructor may deliver this entire two-section program at one time. Ideally, however, Section One should be taught several days before Section Two to allow time for the student or physician to review and practice appropriate techniques. If an actual patient is not available for Section Two, a simulated patient may be used.*

# Section One: Roundtable Discussion Workshop

## I. Description

*This section is a roundtable-type presentation and discussion on the osteopathic approach to the treatment of a patient with degenerative disc disease.*

## II. Cognitive Components

### A. Case Presentation

A 50-year-old male bricklayer presents with progressive low back pain during the past four years. He has occasional tingling radiating down the posterior thigh, stopping at the knee. He denies having weakness, change in bowel or bladder habits, increased pain with cough or sneeze, and new trauma. He rates his pain an 8 on a scale of 10 at its worst and a 3 at the best. The pain is worse in the morning and in the evening after he returns home from work.

The patient has been using over-the-counter pain medications that has relieved the pain, but the pain has been becoming more difficult to manage. The patient reports smoking a pack of cigarettes a day for 30 years and drinking a six-pack of beer every day over for the past 15 years.



#### Physical Examination

| | |
|---|---|
| **Vital signs:** | Temperature, 98.4° F; Blood Pressure, 149/90; Respiratory Rate, 15; Pulse, 88; Height, 6″3′;Weight 240 lbs |
| **Head:** | Normocephalic; symmetrical |
| **Eyes:** | Pupils equal and reactive to light and accommodation |
| **Ears:** | Tympanic membranes clear; good cone of light bilaterally |
| **Nose:** | Nares patent without nasal septal deviation; pharyngeal mucosa pink and moist |
| **Throat:** | No thyromegaly noted; no lymphadenopathy noted |
| **Abdomen:** | Soft, nontender; bowel sounds present in four quadrants; no hepatosplenomegaly; no rebound or rigidity |
| **Cardiac:** | Heart rate and rhythm regular without murmur; S3 or S4 |
| **Extremities:** | Pulses +2/4 in upper and lower extremities; strengths +5/5 in upper and lower extremities; no edema or cyanosis noted |
| **Lungs:** | Rare inspiratory wheeze noted in all lung fields, with distant breath sounds in all fields; slight increase in tactile fremitus noted; an increase of anteroposterior diameter of the thoracic cage noted |

**Musculoskeletal:** Flattened lumbar lordosis; Heberden's nodes noted on distal interphalangeal joints of index fingers bilaterally; marked restriction of lumbar backward bending due to increased pain; lumbar flexion restricted to 70 degrees

**Neuro:** DTR +2/4 upper and lower extremities; sensory intact upper and lower extremities; negative straight leg raise bilaterally in lower extremities; negative Babinski's sign

### Osteopathic Structural Examination

- Standing posture forward flexed at waist 15 degrees
- Pelvic compression test positive on the right; standing and seated flexion test positive on the left
- Left anterior superior iliac spine more superior on the right, with the left medial malleolus short
- Left posterior superior iliac spine more superior
- Left sacral sulcus shallow;left inferior lateral angle posterior/inferior
- Lumbar spring test positive; restriction of left rotation around the right oblique axis of sacrum
- L1 is F RRSR; L2–L5 is N RLSR; T1–T10 is RLSR OA FRRSL; C3–C5 is RRSR
- Left first rib dysfunctional in superior direction

### Diagnostics

- From lumbar spine series, decreased disc space at L3–L4, L4–L5, and L5–S1
- Spondylosis of facets at same levels, with mild to moderate narrowing of vertebral foramen on the right of L3–L4
- Osteoteophytic formation in anterior lumbar bodies of L3–L5

## B. Pathophysiology

1. The functional spinal unit consists of two adjacent vertebrae, one intervertebral disc and all ligamentous, lymphatic or vascular, and neural components. The interspinal discs support loading forces throughout the segment's range of motion. Degenerative changes of the spinal unit alter biomechanics, neurofunction, and stability. This degeneration goes hand-in-hand with spondylosis as a whole. A part of this degeneration is related to the disc itself and is therefore called degenerative disc disease.

2. The intervertebral disc (IVD) has an outer annulus fibrosis (AF), inner AF, transitional zone (TZ), and nucleus pulposus (NP). The outer AF is a concentric organization of Type I collagen fibers and fibrocyte or fibroblast cells. The TZ and inner AF have increasing amounts of Type II collagen fibers and chondrocytes, with decreasing amounts of Type I collagen fibers and fibrocytes. The NP is mostly Type II collagen fibers, chondrocytes, and proteoglycans, thus possessing a viscoelastic property. The outer AF is attached to the cortical endplate of the vertebrae by Sharpey's fibers. Because of the types of collagen fibers, cellular make-up, and matrix present in the disc, the structure is able to handle torsional, shearing, and axial forces. The accommodation of the loading forces is strengthened by the facets, anterior longitudinal ligament, posterior longitudinal ligament, and ligamentum flavum.
3. Nutrition to and from the disc is via a diffusion process between the outer AF and vertebral endplate vasculature. The disc without degeneration is very avascular and innervated in the outer AF. The innervation may serve as an anatomical basis for discogenic back pain. Dorsal root ganglia have substance P receptors and glutamate receptors. Glutamate is suspected to rise from degeneration of the IVD. The sinuvertebral nerves (arising from the ventral root and gray rami) innervate the AF and posterior longitudinal and are thought to be part of the pain process.
4. IVD degeneration is a natural process of aging. Younger patients have more proteoglycans in the NP, which accounts for more hydration of the disc. With age, and thus chronic biomechanical loading, there are less proteoglycans and thus a decrease in hydration. The inner AF loses collagen organization and desiccates into fibrocartilaginous material. The outer AF loses structural organization, which is expressed as cracks or fissures, with some coalescing into large channels. Herniation of NP is predisposed through these channels. The degenerative process also accounts for the loss of disc height. The signs and symptoms that occur depend on where the herniation occurs. Symptoms range from myelopathy neurogenic claudication with central canal stenosis and radicular symptoms if a lateral herniation occurs.
5. Symmetrical changes of disc extensions are called bulges. A disc herniation is defined as nuclear material expressed through an AF defect. If the fragment herniates beyond the posterior vertebral body margin, it is called a disc protrusion. If the fragment is expelled further and is still in contact with the central disc, it is called an extrusion. A sequestered disc fragment has no direct connection to the disc and is free to migrate.
6. With aging, the already sparse vascularity of the outer AF decreases. However, at the vertebral endplate is a proliferation of vessels at the areas of degeneration, which leads to sclerotic changes. These changes further impede adequate nutrient and waste diffusion. As diffusion decreases, oxygen consumption decreases, matrix production decreases, and lactate levels increase. This process results in an acidic environment that negatively affects the cellular make-up of the disc.

7. Pain can affect patient functioning and is generated from several tissues structures. Derangement of the NP and AF, and thus annular tears, results in discogenic pain. Structural changes in the facets joints vertebral bodies, ligaments, and paraspinal muscles generate pain as well. All of these can generate enough nociceptive input to establish a facilitated segment, thus establishing somatic dysfunction. This aspect, plus collapsing disc space and increased loading onto the facets, can alter biomechanics and further encourage somatic dysfunction. This process encourages the development of spondylosis, which then results in the development of osteophytes of the facet and vertebral endplates. As this disc space decreases due to facet osteophytes, neural foramina narrow, thus impinging upon the nerve roots and causing radicular symptoms. The ligamentum flavum can thicken and buckle on itself, exerting central pressure on the dural sac. The result is neurogenic claudication and myelopathy that can severely affect patient function.
8. All of these pathologic changes produce activation of nociceptors. The chronicity of this activation can produce somatic dysfunction and chronic pain. The patient will have functional challenges. OMM/OMT in combination with conservative medical management, can optimize treatment. A decision to manage the condition surgically should be made only after all other treatments options are exhausted, the patient requests evaluation, or a dramatic change in the patient's presentation warrants a surgical evaluation or intervention.



## C. Functional Anatomy

Includes knowledge of structure and physiology necessary to properly carry out the OMM/OMT support.

Review the following regions:

1. Boney anatomy
   - Lumbar spine, sacrum, and innominates
   - Spinal canal and cord
2. Muscles
   - Hip flexors and extensors
   - Hip  internal and external rotators
   - Hip abductors and adductors
3. Nerves
   - Lumbosacral plexus
   - Dermatome patterns of lower extremity
   - Reflexes of lower extremity
4. Ligaments
   - Ligamentum flavum
   - Anterior and posterior longitudinal
5. Sacral axes of motion

6. Lumbosacral angle (Ferguson's angle)
7. Radiographs of lumbar spine (inclusive of oblique view)

## D. Goals for Osteopathic Manipulative Management

Includes a review of treatment pearls; a general plan for manipulative treatment of the patient; and a discussion of treatment options, contraindications, and plans for follow-up evaluation and treatment.

1. Medical Issues
   - Weight loss regimen to take pressure off low back
   - Smoking cessation
   - Dietary changes to affect high blood pressure and weight
   - Control of pain with non-narcotic measures
   - Determination of additional diagnostic studies
   - Cessation of alcohol consumption
2. Manipulative Management
   - Improve mobility throughout lumbar spine, pelvis, and sacrum
   - Increase mobility throughout hip rotators to take stress off the sacrum and innominate
   - Improve postural mechanics through total body evaluation and treatment of dysfunctions
   - Identify ways to improve body mechanics given the structural pathology in the lumbar spine
   - Decide on safe manipulative modalities various body regions
   - Identify ways to help patient perform activities of daily living and work to decrease strain on lumbar spine



## E. Contraindications and Cautions Regarding Treatment

See contraindications to treatment, Foundations, pp. 1015–1024.

1. High-velocity low amplitude to lumbar spine and pelvis
2. Evaluate liver and renal functions, before prescribing NSAIDs
3. Judicious observation for alcohol withdrawal needed, and if necessary, an inpatient detoxification may be necessary

## F. Instructor's Notes

Personal clinical pearls and lessons learned from previous COILS presentations.

1. Evaluate the entire patient, looking for significant dysfunctions that may be adding to the total strain pattern. Defining functional vs. structural pathology is important when evaluating for these dysfunctions.

2. Treat the patient from the feet up to the pelvis and lumbar spine, and then from the cranium down to the lumbar spine, may facilitate improvement in the total strain pattern. There should be a decrease in total body pain due to a decrease in nociceptor activity related to somatic dysfunction.
3. Improve function that allows the patient's body to compensate in a standard manner given the structural limitations. OMM/OMT will not improve the structural changes.

## III. Psychomotor Components

*If time permits, this part can be carried out on a simulated patient.*

1. Practice palpatory diagnosis. (See techniques under Section D above.) Diagnostic procedures include postural screen, palpation for tissue texture changes, segmental motion testing, and diagnosis of somatic dysfunctions
2. Demonstrate key treatment techniques in the body regions involved:
   - Application of osteopathic philosophy and treatment techniques,
   - Reevaluation of the patient after treatment is completed to assess results. If a simulated patient is used, then the student or physician should verbalize length of treatment and future treatment goals.



## IV. Cognitive Components

1. Documentation in the medical record.
2. Post-treatment discussion.

## V. References

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Jonsson B, Stromqvist B. Symptoms and signs in degeneration of the lumbar spine. A prospective, consecutive study of 300 operated patients. *J Bone Joint Surg Br*. 1993 May;75(3):381-5.

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## VI. Examination Questions

*These multiple-choice questions involve the treatment of a patient with degenerative disc disease.(* denotes answer)*

1. **A patient presents complaining of low back pain. Plain lumbar radiographs demonstrate disk space narrowing and osteophytic changes. Which of the following diagnoses may explain the patient's symptoms?**
    A. Ankylosing spondylitis
    B. Degenerative disk disease
    C. Herniated nucleus pulposis
    D. Lumbar strain and sprain
    E. Spondylolisthesis

2. **A patient is evaluated for degenerative disk disease and found to have decreased range of motion of the lumbar spine. Examination demonstrates decreased hip extension and external rotation of the right lower extremity, with a tender point over the lesser trochanter of the femur. Which of the following is most likely the cause of the patient's presentation?**
    A. Piriformis muscle spasm
    B. Psoas muscle spasm
    C. Adductor magnus spasm
    D. Gluteus maximus spasm
    E. Quadratus lumborum spasm

3. **A patient is treated with osteopathic manipulative medicine for somatic dysfunctions related to lumbar degenerative disk disease. After treatment and on re-examination, the patient is found to have increased range of motion and better symmetry. Which of the following exercises may maintain the improved range of motion?**
    A. Deep knee bends with pelvic tilt
    B. Abdominal crunches
    C. Biceps femoris stretching
    D. Stationary bicycle
    E. Supine leg lifts

4. **A patient with severe degenerative joint disease and central spinal stenosis is treated with OMM/OMT and sent to physical therapy for a home exercise program. Which of the following should be included as directions for the physical therapist?**
    A. Flexion stretch exercises
    B. Extension strengthening exercises
    C. Side-bending stretch exercises
    D. Left rotation stretch exercises
    E. Hip flexion strengthening exercises

## Section Two: Patient-Based Application Workshop

### I. Description

*This section includes the practical application of osteopathic treatment techniques to support the patient with degenerative disc disease.*

### II. Psychomotor Components

*(Refer to Section One for regions of the body that are involved.)*

1. Examination of the patient using TART, including postural screen, palpation, segmental motion testing, and diagnosis of somatic dysfunction.
2. Application of philosophy and treatment technique.
3. Re-evaluation of the patient after treatment is completed to assess result. If a simulated patient is used, then the student or physician should verbalize length of treatment and future treatment goals.

### III. Cognitive Components

1. Documentation in the medical record.
2. Post-treatment discussion.

*Note. It is recommended to use the standardized outpatient form included in each of these chapters for documentation*

Physician:_____ Date: _____

Title: [ ] Resident (Specialty) _____

[ ] Intern [ ] OMS III [ ] OMS IV

## Critical Actions Evaluation Checklist of Osteopathic Principals Applicable to a Patient with Degenerative Disc Disease

| CRITICAL ACTION | COMPLETED | | COMMENTS |
|---|---|---|---|
| | Yes | No | |
| Become familiar with the patient's history physical examination findings, laboratory and other diagnostic findings. | | | |
| Perform an osteopathic structural examination. | | | |
| Determine significant areas of somatic dysfunction. | | | |
| Determine body region(s) to be treated with OMT. | | | |
| Apply OMT to at least the body region determined to be the most in need of treatment at present time. | | | |
| Treat other significant somatic dysfunctions if feasible. | | | |
| Document treatment and immediately observable effects. | | | |

Trainer:_____

# Osteopathic Musculoskeletal Examination

EXAMINER: SIGNATURE DATE OF EXAMINATION

EXAMINER: SIGNATURE DATE OF EXAMINATION

CHIEF COMPLAINT:

**Required**

**Ant.Post.Spinal Curves:**

Cervical Lordosis

☐ Increased ☐ Normal ☐ Decreased

Thoracic Kyphosis

☐ Increased ☐ Normal ☐ Decreased

Lumbar Lordosis

☐ Increased ☐ Normal ☐ Decreased

**Scoliosis** (Lateral Spine Curves)

☐ None ☐ Functional ☐ Mild ☐ Modeate ☐ Severe

**Assessment Tools**

☐ T= Tenderness

☐ A= Asymmetry

☐ R= Restricted Motion ☐ Active ☐ Passive

☐ T= Tissue Texture Change

For coding purposes only

**Abbreviation Key**

**OA** Occipito-Atlantal joint

**Sympathetic Ganglia:**

**C** Celiac

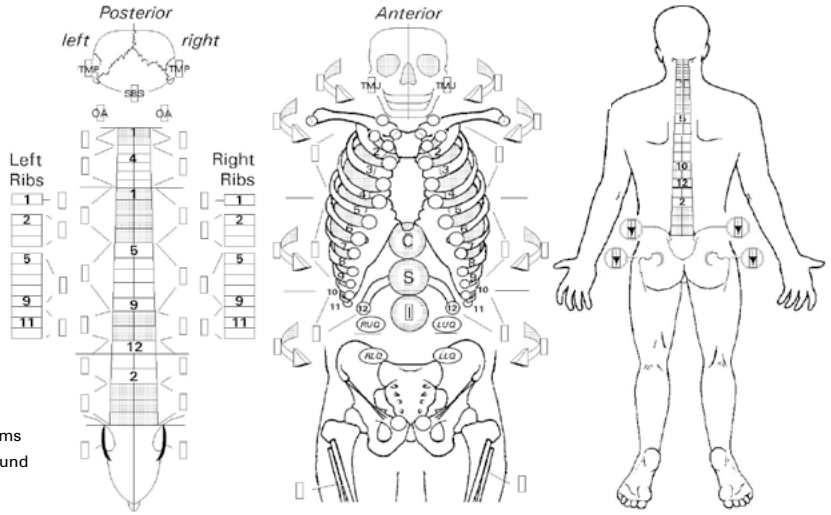
**S** Superior Mesenteric

**I** Inferior Mesenteric

**TMJ** Temporomandibular joint

**TMP** Temporal Bone

**SBS** Sphenobasilar symphysis




**Severity Key**

**0** No SD or background (BG) levels

**1** Minor TART more than BG levels

**2** TART obvious (R&T esp) +/- symptoms

**3** Symptomatic, R and T very easily found "key lesion"

| Region Evaluated | | Severity 0 | 1 | 2 | 3 | Specific Major Somatic Dysfunctions |
|---|---|---|---|---|---|---|
| Head | | ☐ | ☐ | ☐ | ☐ | |
| Neck | | ☐ | ☐ | ☐ | ☐ | |
| Thoracic | T1-4 | ☐ | ☐ | ☐ | ☐ | |
| | T5-9 | ☐ | ☐ | ☐ | ☐ | |
| | T10-12 | ☐ | ☐ | ☐ | ☐ | |
| Lumbar | | ☐ | ☐ | ☐ | ☐ | |
| Pelvis/Sacrum | | ☐ | ☐ | ☐ | ☐ | |
| Pelvis/Innominate | | ☐ | ☐ | ☐ | ☐ | |
| Extremity Lower | R | ☐ | ☐ | ☐ | ☐ | |
| | L | ☐ | ☐ | ☐ | ☐ | |
| Extremity Upper | R | ☐ | ☐ | ☐ | ☐ | |
| | L | ☐ | ☐ | ☐ | ☐ | |
| Ribs | | ☐ | ☐ | ☐ | ☐ | |
| Other/Abdomen | | ☐ | ☐ | ☐ | ☐ | |

**Major Correlations with:**

☐ Traumatic ☐ Orthopedic ☐ Neurological ☐ Viscerosomatic ☐ Primary Musculoskeletal ☐ Cardiovascular

☐ Rheumatological ☐ EENT ☐ Cardiovascular ☐ Pulmonary ☐ Activities of Daily Living ☐ Genitourinary

☐ Other: _____