Osteopathic Treatment of Discogenic Problems

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DISEASE COMPONENT

Specific Spinal Pathology:
- Biomechanical Theory
- Imaging Findings

HOST COMPONENT

Patient Response Characteristics:
- Subgroup Identification
- Clinical Outcome

- Exclusion of red flags (<1%)
- Diagnostic work-up
- Classification of LBP
  - Nociceptive back pain
  - Somatic referred pain
  - Radicular pain
  - Radiculopathy
- Management plan specific to patho-anatomical and functional changes

 DIRECT METHODS
 INDIRECT METHODS
 COMBINED METHODS
 HOMEOSTATIC METHODS

 Postural Control and Movement
 Integrated Autonomic Function
 Circulation
 Behavior and Adaptation
 Metabolic, Immune and Endocrine

 The Total Musculoskeletal System: “Primary Machinery of Life”

Symptom Reduction
“Motion is Lotion”
Physiological Response
Proposed Sequencing

Respiratory – Circulatory Model:
- Venolymphatic drainage ↑
- Arterial supply ↑
- Pressure nerve root ↓
- Absorption disc material ↑
- Improved biochemical environment around nociceptors

Blomechanical – postural model and neurological model
- Nociception and pain ↓
- Function and motion ↑
- Biomechanical stress ↓
- Optimizing load transfer
- Sensorimotor control ↑

1. Treat the thoracic inlet
2. Treat the respiratory diaphragm
3. Release the lesser omentum
4. Perform the liver pump
5. Release the mesenteries
6. Move fluids: lymph pumps

1. Treat the thoracolumbar junction
2. Treat the psoas muscle
3. Treat motion segment restrictions in the lumbar spine
4. Treat the pelvic girdle
5. Rhythmic traction lumbar spine
6. Treat the neural tissues
Respiratory – Circulatory Considerations
Circulatory Considerations

- The vessels of the venous system can also play a role in the generation or worsening of disk-related symptoms

Relevant anatomy
- The valveless veins of the spinal canal form an uninterrupted anastomotic chain running from the skull base to the sacrum
- The degree of filling of the lumbar epidural veins depends on the central venous pressure
- The venous plexus of the spine are also a venous pathway connecting the superior and inferior vena cava
- Together with the azygos system, they form a collateral venous circulation that operates beyond the local level, coming into play physiologically whenever the venous pressure is elevated in the thoracic, abdominal, or intracranial cavities
- Elevations of pressure in the chest and abdomen worsen disk-related pain because they increase the degree of filling of the epidural veins

Clinical considerations
- Reduce congestion
- Influence absorption of material from extrusion & sequestration
The Thoracic Inlet Region

- HVLA to treat upper thoracic segments
- Long-lever articulatory techniques to stretch MF structures and move fluids
- Treatment of 1st Rib → FPR / Still – Technique
- Treatment of AR1 with Counterstrain → also releases the thoracic inlet
- Myofascial release of the thoracic inlet with pumping to move fluids

Gaughran GR. Suprapleural membrane and suprapleural bands. Anat Rec 1964; Apr; 148: 553 - 559
The Respiratory Diaphragm

Treating the respiratory diaphragm in patients with discogenic pain is important for numerous reasons: it influences the musculoskeletal system in the thoracolumbar spine, the AVL systems and the visceral system.

Potential causes of diaphragmatic dysfunction:

- C3 – C5 somatic dysfunction
- Ligamentous strain from pericardiac ligaments
- Rib somatic dysfunction
- Lower thoracic somatic dysfunction
- Upper lumbar somatic dysfunction
- Psoas muscle
- Quadratus lumborum muscles
- Visceroptosis
- Posture

Pettiaux N et al. Three-dimensional reconstruction of human diaphragm with the use of spiral computed tomography. J Appl Physiol 1997; 82(3): 998 - 1002
Lesser Omentum

W Thiel (2002), Gregoire & Oberlin 1991
Visceral or ventral manipulative techniques can be used in the abdominopelvic region to reduce congestion and improve circulation to the viscera:

- The root of the mesentery is often treated in patients with upper GI dysfunction
- The mesenteric lift is used to reduce congestion and improve circulation to the small intestines
- This congestion is often associated with visceral ptosis

- Carl P McConnell, D.O. considered the root of the mesentery to be the axis of movement for all abdominal organs during respiration
- The root of the mesentery is frequently hypothesized to be a common cause of recurrent lumbar spine somatic dysfunctions

Perlemutter and Wagilora (1976)
These procedures should not be used if the patient has an abdominal incision, acute ischemic bowel disease, aortic aneurism, obstruction, or similar condition.
Releasing the Mesenteries

- **Objective:** to release the mesenteries to help decongest and improve circulation to and from the organs

- For the root of the mesentery, place your hands inferior to an imaginary line spanning from 2cm superior and 2cm lateral on the left side of the umbilicus to the ileocecal junction

- ‘Lift’ the root in the direction of the patient’s right axilla

- When tension is felt, the other hand will do gentle oscillations of the right lower extremity

- Technique is performed until a softening is felt under the hand contacting the root

- For the mesenteries of the ascending and descending colon, the hands are gently pushing either of the colons towards the patient’s midline, and held until a softening can be felt
Biomechanical – Postural and Neurological Considerations
LBP of Thoracolumbar Origin

- LBP of thoracolumbar origin is common in clinical practice, it may be acute or chronic, and its character is similar to that of pain of lumbosacral origin.
- This may also include pseudovisceral abdominal pain, pubic and trochanteric tenderness associated with this.
- Note the anterior ramus (1): groin pain of discogenic origin has recently been demonstrated in L2 distribution.

Distribution of spinal nerves T12 and L1:
1. Anterior ramus
2. Posterior ramus
3. Perforating lateral cutaneous branch

The lumbar zygapophyseal joints (ZAJ) are designed to limit or block axial rotation.

The protects the intervertebral disc from excessive torsion.

Although approximating the sagittal plane, the surface of the lumbar ZAJ are either flat, C–shaped or J–shaped.

On average there is 2 – 3° of axial rotation possible per segment.

There is a sudden change of joint structure occurring in the region of a single vertebra T12: orientation of ZAJ changes abruptly.

Lack of axial rotation in the lumbar spine is compensated at this junction.

Motion restriction at T12 may increase the biomechanical stress in the lumbar spine.

<table>
<thead>
<tr>
<th>Principles HVLA in the Thoracic Spine: Sagittal Plane Techniques</th>
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<tbody>
<tr>
<td>(a) <img src="image1" alt="Diagram" /></td>
</tr>
<tr>
<td>Contact is made with the <strong>inferior</strong> vertebra in the somatic dysfunction. With either (a) flat hand or (b) a fist, the transverse processes of that vertebra is contacted.</td>
</tr>
<tr>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td>Keeping the motion purely in the sagittal plane, the patient is brought into flexion until the motion can be felt at the dysfunctional segment.</td>
</tr>
<tr>
<td><img src="image5" alt="Diagram" /></td>
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<tr>
<td>Using your body, a thrust is given in an postero-superior direction. The hand contacting the inferior vertebra in the somatic dysfunction is acting as a fulcrum upon which the superior vertebra is moved.</td>
</tr>
</tbody>
</table>

Fossum (2007)
Thoracic HVLA: the Dog Technique

- Similar to the ‘Kirkville – Crunch’ with modifications to planes of treatment and position of the hand the thoracic vertebra or the rib being treated
- Allows you to limit the pre-thrust tension to one plane of motion, thus minimizing the stress on painful structures
- Because the technique aims at separating (cavitation) rather than gliding joint surfaces, the joint can be treated in its relative neutral, minimizing stress on painful structures
Psoas Muscle and Discogenic Pain

- The axial compression on the lumbar IVD from the psoas muscle may negatively influence both the cell mechanics and the extracellular matrix mechanics in the anulus fibrosus of the IVD.

- Unilateral axial compression from psoas muscle on one side only may shift the nucleus pulposus (bulging or extrusion) and also increase the torsional stress on the annulus fibrosus (→ pain from radial fissures).

- The axial compression on the lumbar spine from the psoas muscle may also restrict motion segmentally in the lumbar ZAJ with exacerbates the condition at the involved FSU.
TLJ, Lumbar IVD and Lumbosacral Mechanics

The Progenitor:
Type II Somatic Dysfunction TL Junction Region

Psoas Tension +++

Axial Compression or Rotational Stress Lumbar IVD

Sacral Rotation on Oblique Axis / Sacral Torsion or Unilateral “Shear” in the form of a Unilateral Sacral Flexion

Typical Pattern:
SD and Stress L5 – S1

Piriformis Tension +++
Suggestions on treating the Psoas Muscle

- Treatment of the thoracolumbar junction and upper lumbar spine prior to treating the psoas muscle in patients with discogenic pain.
- Counterstrain: this technique is helpful in addressing the psoas muscle specifically. Although the position requires a great deal of flexion with SB and rot, patients with discogenic pain usually tolerate it well.
- If condition is very acute, consider holding the position of comfort for longer than 90 seconds.
- James Cyriax, M.D. used the “Dallison Technique” (see picture) on patients with acute discs.
- This technique bears resemblance to how osteopathic physicians treat the psoas muscle using counterstrain.

Osteopathic Considerations: Biomechanical

- Muscle Energy Techniques (MET)
  - If tolerated by the patient → seated position
  - Use transatory motions
    - A – P translation for flexion and extension: may prevent unwanted movement of the nucleus pulposus as with pure F or E
    - Lateral translation: with the sidebending component the coupled rotation will follow automatically. Less concerns about altered coupling behavior at FSU
  - PIR variation: restore motion at FSU
  - Ruddy variation: reduce venolymphatic congestion

- MET can also effectively be used to improve sensorimotor control of the spinal motion segment
  - Ensure to keep to contraction effort from the patient light in order to prevent recruitment from the polyarticular muscles
Combined Leverage and Thrust in the Lumbar Spine in Patients with Discogenic Pain

Advantages:
Using combined leverages allows the operator to manufacture a pre-manipulative barrier within the physiological range that is usually not at the end-point. This minimizes stress on tissues and is done short of pain for patient

- The spine is kept in a neutral position and the technique utilizes physiological locking of the spine from above and below (e.g. myofascial locking as opposed to approximation of joint surfaces)

- Why neutral position?
  - Mathematical analyses of the lumbar IVD shows that with bending moments (flexion) the stress on the AF is 450 times greater than with spinal rotation and they conclude that there is no radial expansion or extrusion (bulging) during twisting*
  - Extension may aggravate the patients symptoms
  - In neutral there is less stress or strain on inflamed or injured tissue (pain ↓)

Lumbar HVLA: Targeting Right ZAJ

- **Theoretical Consideration:**
  - Separate the right zygapophyseal joint
  - \( \text{ERS}_{\text{RIGHT}} \) (right ZAJ “will not open”) or \( \text{FRS}_{\text{LEFT}} \) (right ZAJ “will not close”)

- **Leverages:**
  - Upper lever: use primarily side-bending (“soft-tissue locking”) down to the superior vertebra in the dysfunction
  - Leg closest to table is used to bring the segment being treated into neutral
  - Upper leg is flexed until movement is felt at the inferior vertebra in the dysfunction

- **Approximation:**
  - Patient is “rolled” en-bloc towards the clinician and clinician approximates the patient leaving no space between them

- **Momentum Induction:**
  - Use of gentle rocking movements of the patient until a state of relaxation is obtained

- **Thrust:**
  - Body-drop: “wagging the tail”
1., 2. and 3. degree lesions

- The first degree lesion is a simple uncomplicated movement in which the axis of movement is unchanged and is still safe within the nucleus of the intervertebral disc.

- In the second degree lesion there is a change in the position of the axis, and the vertebra in combination with its neighbors begins to swing in reverse rotation and “collapse into its curve” in the effort to sustain the weight from above.
  - What puzzled many with the second degree lesion is the “fact” that the spinous processes does not cross the mid-line of the body although the transverse processes reverse their positions anterior and posterior.
  - The spinous processes is closer to the midline and it is closely approximated to the spinous process below.
  - The mechanics is entirely different from the first degree type and demand a technique of correction that is entirely different.

- The third degree lesion is merely an extension of the second degree lesion to the opposite side and is an extremely difficult condition to treat.
• Under increased loading or weight bearing, the tripod provides stability with flexibility of movement
• When only one leg of the tripod is weight-bearing, alteration of position by the vertebra is easy. This is especially true when the nucleus pulposus if the IVD is the point as in flexion (FB)
• When two legs of the tripod, as in side bending or extension (BB), are weight-bearing, alteration in position of the vertebra is more difficult. But the position is not stable as it is when all three are functioning

• Rotation can take place around any of the three vertical axes (nucleus pulposus or either of the ZAJ)
• There are four axes about which a vertebra may tip ('tipping movements') from the horizontal plane:
  • In flexion the vertebra tips forward around a axis through the nucleus pulposus
  • In extension the vertebra tips backwards around an axis running though both inferior articular facets
  • In side-bending there is a tipping about a diagonal axis passing through the inferior articular facet and the nucleus pulposus below the body
The Second Degree Lesion

- **2nd degree lesion:**
  "Discocorporal Lesion"

- **Violates normal physiological axes of motion**

- **Places great stress on the functional spinal unit (FSU)**

- Similar to ideas such as "complicated lesion" (Hoover) and "Derailed lesions" (Fryette)
- Can be caused by trauma
- Can be caused by superimposed dysfunctions → Type II mechanics superimposed on Type I mechanics

**Mobility testing:**

- **Hypermobile**
- **VERY restricted**

**Posterior TP on the right side AND an SP that does NOT cross the midline despite the rotation (because of the shift towards the right)**
The severity of a Type II superimposed on a Type I depends on the location:
- Where the curve crosses the midline: less severe for the patient (yellow)
- Closer to the apex of the: more severe (red)
Exaggeration Technique Lumbar Segment

Example 2nd Degree Lesion with vertebra shifted to the right:

- Patient is comfortably seated
- Contact the articular pillar of the inferior vertebrae in the FSU to be treated
- The patient is flexed through posterior translation until localized to the FSU
- The patient is translated to the right so that the vertebra is further shifted to the right side
- Add a little rotation to the right
- Use gentle compression from contact on patients shoulder towards the FSU
- Use a suitable blend of “push and pull” and articulate the FSU in a “figure-of-eight” fashion
- In this example to get the “motion going, start with left rotation and __________ extension
- Reassess the motion at the FSU

The Force, Amplitude and Rhythm is adapted to the condition being treated
Proposed Sequencing

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