Use of Axial Myofascial Hydrostat Test in Identifying Areas of Focus for Osteopathic Manipulative Treatment to Relieve Symptoms of Ehlers Danlos Syndrome: A Case Study

Samantha Gottlieb, OMSIII, David Tegay, DO, Jayme Mancini, DO, PhD

1 New York Institute of Technology, Old Westbury, NY 2 NYITCOM Dept. of Clinical Specialties, 3 NYITCOM Dept. of Osteopathic Manipulative Medicine

Introduction
Hypomobility Ehlers Danlos Syndrome (hEDS)
- Previously Ehlers-Danlos Syndrome (EDS) type II1
- Prevalence of 1 in 5,000 people1,2
- Clinically diagnosed connective tissue disorder2
- Appears to include a genetically heterogeneous population with non-genetic factors influencing severity1,2
The axial fascia of the thorax and abdomen form body tubes with several physiological functions, including maintaining hydrostatic pressure balance.3

The biomaterial properties of connective tissue in hEDS may prevent appropriate internal pressure changes, leading to various features.3,4

Common clinical features include multiple body systems:3,4
- Temporomandibular joint dysfunction
- Spinal misalignments, spondylosis & intervertebral disc degeneration
- Rib dysfunction & respiratory discomfort
- Low back pain & sacroiliac joint dysfunction
- Abdominal wall & pelvic floor tone imbalance
- Multiple joint dysfunctions
- Loss of spring in the arches of feet
- Dysautonomias
  - Syncope due to orthostatic intolerance
  - Abdominal bloating & indigestions - gastrointestinal paroxysms
  - Migraines
  - Ocular dysfunctions

Axial Myofascial Hydrostat Test
The AMHT was developed to test for weakness or tone imbalance in the abdominal wall that leads to clinical symptoms. The abdomen is a cylindrical myofascial vessel bordered by the thoracolumbar and pelvic diaphragms. This mediates hydrostatic pressure. The rectus abdominis muscles are separated by connective tissue that is frequently weakened, often leading to rectus diastasis. Connective tissue laxity in the myofascial cylinder may make it difficult to coordinate hydrostatic pressure changes that accompany breathing. The AMHT for failure to mediate hydrostatic pressure at the linea alba and rectus abdominis is performed by placing one hand at the superior border of the rectus abdominis and the other at the lower border. Place moderate pressure to gain a firm grasp on the abdominal muscles. Then, approximate the left and right abdominal wall. The test is positive if the patient experiences decreased work of breathing whilst the test is performed. A positive test indicates excessive tissue compliance and inability to adequately mediate pressure exchanges for ventilation. The manual restoration of hydrostatic pressure balance may also aid in identifying somatic dysfunctions that additionally contribute to the symptom, which may improve with OMT.

Case
A 19-year-old female with HEDS presented to the NYITCOM EDS Program with 2-weeks of:
- left rib pain worse with deep inspiration, difficulty breathing, chest stiffness, & dysmencorrhea that radiates to ribs, back & legs bilaterally
- She noted feelings of early stomach fullness yet was still hungry
- Symptoms had progressively worsened since age 9 years until age 17 years, when they improved or resolved with OMT.

The patient is a college sophomore, teaching and resident assistant who enjoys scuba diving in her spare time. She notes a marked decrease in symptoms after dives, which can last up to two weeks. Amory TAADNextel panel 22 of genes associated with thoracic aortic aneurysms and dissections and blood markers of inflammatory, immune, and infectious conditions were negative.

Physical Exam
Respiratory-Circulatory concerns
- Positive AMHT of linea alba for difficulty breathing
- Hypertonic myofascial ring of the hyoid-associated muscles, levator scapulae, serratus anterior and pectoralis minor
- Left 5th rib exhalation dysfunction & torsion
- T2-5 N SL RR
- Right 3rd rib inhalation dysfunction & costochondral separation
- External-internal oblique imbalance
- Pelvic girdle instability: left sacroiliac and pubic shear
- Grade I pelvic organ prolapse

Biomechanical concerns
- Mildly dolicocephalic, mild malar flattening; Mild hypertelorism with enophthalmos, high palate, N Head W/L, HC 66cm (~75%), AS 175.25, N chin/neck
- UE/LE Segment 0.943 (N >0.85), Arm Span/Height 1.025 (N <1.05),
  + wrist sign - thumb overlaps distal 5th fingernail, + thumb sign - distal phalanx past ulnar border
  + mild thoracolumbar scoliosis,
  +7/8 Bentgon score (DIP/PIP, thumbs, pinkies, elbows, hips)
- Mildly hypertensistible skin, mildly atopich scars at left knee, +velvet texture with mild translucency, striae at flanks, hips, & popliteal fossae

Results
On reassessment, patient noted decreased pain, improved breathing, decreased chest discomfort with inhalation and decreased chest fullness. Furthermore, the AMHT was negative and muscle tone balance improved.

Methods
Focusing on a patient-centered outcomes approach, the goal of OMT was to decrease current symptoms. Autonomic symptoms were rated by the patient on the SCOPA-AUT questionnaire. The AMHT was utilized to develop a plan for OMT to:
1. Balance muscle tone
2. Reduce subluxed joints to restore a functional alignment
3. Balance range of motion in joints distorting the axial myofascial hydrosract
4. Decrease pain
5. Improve sympathetic-parasympathetic balance

Conclusions
This case demonstrated an osteopathic approach to connective tissue disorders having increased tissue compliance. The AMHT in this case identified the linea alba/rectus as a symptomatic area of excessive tissue compliance. Based on the myofascial tubes related to the patient’s tissue compliance and physical examination, including AMHT, we were able to focus OMT and alleviate some of the common features of hEDS. Using a patient centered outcomes approach, we were able to tailor treatments to her specific needs and improve her symptoms.

Further studies should investigate the internal cavity pressures during activity and nutritional and endocrine levels amongst patients with hEDS while using AMHT, as well as the efficacy of using AMHT to guide OMT in specific hEDS features. Additionally, further research to characterize dysfunctions linked to common features of hEDS and usefulness of OMT as an effective treatment modality should be conducted acutely and longitudinally to identify the long-term effects of OMT on Ehlers Danlos patients.

OCT Techniques Used
Myofascial Release:
  Fascia attached to trachea, hyoid, & Scapulae
Abdominal wall
  Pelvic floor
Stills Technique:
  Pelvis
  Left rib torsion
Muscle Energy:
  Hyoid
Doming of the diaphragm
HVL:
  Dr. Whitfield’s Angel technique for thoracic dysfunctions & right 3rd rib
Visceral Techniques:
  Pelvic organ lifts

References
3. Chia AG. Foundations of Osteopathic Medicine - Lippincott Williams & Wilkins. 2010

Hypothesis
The Axial Myofascial Hydrostat Test (AMHT) identifies myofascial strains in which to focus Osteopathic Manipulative Treatment (OMT) to help alleviate hEDS symptoms.

Acknowledgements
Special thank you to Damon Whitfield, DO and Alyssa Toia, OMSIV for their contributions to this case.