Introduction

Low back pain (LBP) is the most common chief complaint among patients in chiropractic offices, second to neck pain.\(^1\) Of those seeking professional care, 70% of patients will go to a primary care medical physician or a chiropractor.\(^2\) Even though most LBP is mechanical in origin, underlying pathology is a possibility. In rare cases, patients presenting with a chief complaint of LBP may have pain as a result of a more serious spinal pathology or condition requiring surgical or medical intervention.\(^3\) Due to the higher risk of ominous pathologies in the elderly, careful consideration must be given to life-threatening differentials. Souza suggests differentials that clinicians should rule out when investigating LBP cases. The differentials include but are not limited to: disc lesion, facet syndrome, canal stenosis, spondylolisthesis, sacroiliac sprain, piriformis syndrome, ankylosing spondylitis, Reiter’s syndrome, multiple myeloma, metastatic carcinoma, and abdominal aortic aneurysm (AAA).\(^4\) This report focuses on AAA.

AAA is a life-threatening pathology of the abdominal aortic vascular wall. AAA is a permanent dilation of the aortic wall that ruptures and causes death in 80% of subjects when left untreated. AAAs generally effect older males that present over the age of 65 years.\(^5\) In 2009, it was documented that AAAs result in approximately 15,000 deaths per year.\(^6\) This high mortality rate places AAA as among the top causes of death in the United States. Chiropractic offices may encounter AAAs more often than expected since it often presents as LBP until rupture.\(^4\)

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**Abstract**

**Objective:** To review a case of an atypical presentation of abdominal aortic aneurysm.

**Clinical Features:** A 58-year-old, non-smoking male presented with 2 to 3 weeks of low back pain localized to the right fourth and fifth lumbar vertebrae area.

**Interventions and Outcomes:** Surface electromyography revealed increased muscle tension in the lumbar spine measuring 3 to 6 times normal values. Radiographic examination revealed calcification of the abdominal aorta which measured 8.5 cm in diameter. An immediate referral was made to the emergency room for suspicion of an abdominal aortic aneurysm. The ER did not evaluate the patient and it took a phone call by the chiropractor to get the patient back to the ER where an ultrasound was finally performed revealing a hemorrhaging abdominal aortic aneurysm.

**Conclusions:** This case highlights how life-threatening conditions may mimic common musculoskeletal conditions. Practicing chiropractors must assess each case without preconceived notions. Additionally, a comprehensive evaluation is essential to chiropractic care.

**Keywords:** Abdominal aortic aneurysm, chiropractic, low back pain, Paraspinal Surface Electromyography, sEMG, vertebral subluxation, Radiography, X-ray, Chiropractic BioPhysics®, CBP®

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**Introduction**

Low back pain (LBP) is the most common chief complaint among patients in chiropractic offices, second to neck pain.\(^1\) Of those seeking professional care, 70% of patients will go to a primary care medical physician or a chiropractor.\(^2\) Even though most LBP is mechanical in origin, underlying pathology is a possibility. In rare cases, patients presenting with a chief complaint of LBP may have pain as a result of a more serious spinal pathology or condition requiring surgical or medical intervention.\(^3\) Due to the higher risk of ominous pathologies in the elderly, careful consideration must be given to life-threatening differentials. Souza suggests differentials that clinicians should rule out when investigating LBP cases. The differentials include but are not limited to: disc lesion, facet syndrome, canal stenosis, spondylolisthesis, sacroiliac sprain, piriformis syndrome, ankylosing spondylitis, Reiter’s syndrome, multiple myeloma, metastatic carcinoma, and abdominal aortic aneurysm (AAA).\(^4\) This report focuses on AAA.

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The etiology linking AAA and LBP is important for the chiropractor to understand. LBP and abdominal pain are the
most common symptoms of AAAs. However, AAA can be asymptomatic before rupture. A ruptured AAA can end in death secondary to massive hemorrhaging. For this reason, it is vital for every chiropractor to be aware of the possibility of AAAs presenting in their office. The complex mechanism of LBP associated with a AAA is attributed to the stretching of the aortic wall, disc degeneration, end plate sclerosis, and ischemia of muscles, bones, and nerve roots.

**Case Report**

**History and Examination**

A 58-year-old, non-smoking, 180-pound male presented to a chiropractic office with a chief complaint of LBP and no previous history of LBP. The patient had been experiencing LBP centralized at the fourth and fifth lumbar (L4–L5) region on the right side for 2 to 3 weeks before examination. The patient first noticed the LBP after an extended period of yard work. No red flag signs or symptoms presented during the examination. Red flag signs and symptoms include pain at rest, unrelenting night pains, fever above 38°C (100.4°F) longer than 48 hours, progressive or new onset of neuromotor or sensory deficit, weakness or numbness of the lower extremities, loss of bowel or bladder control, suspected ankylosing spondylitis, significant recent trauma, and (or) history or suspected cancer/tumor.

During motion palpation, severe motion restriction was noted in the lumbar spine. Surface EMG (sEMG) (CLA Insight™ Static and Dynamic Surface Electromyography, Chiropractic Leadership Alliance, Bethany Beach, DE, USA) indicated increased muscle tension in the L4/L5 region measuring 3 to 6 times normal. Blood pressure was 125mm/Hg systolic over 85mm/Hg diastolic. The physical exam did not warrant any suspicion of a AAA and no abdominal exam was performed.

The attending doctor uses Chiropractic BioPhysics® (CBP®) protocols and procedures in patient analysis and treatment. As per CBP® protocols, a radiographic examination is done as part of the spinal exam (barring exclusionary criteria). Initially, the patient was reluctant to have radiographs taken due to financial reasons. However, the doctor discussed the importance of the radiographic examination and the patient agreed to have x-rays taken of his area of complaint. A lateral lumbar film (Figure 1) and an anterior to posterior lumbar film (Figure 2) were taken and analyzed.

**Results**

The sEMG scan was done in accordance with published protocols. The results of the patient’s sEMG scan were compared to the published reference values and graded as mild, moderate, or severe changes in muscle tension or activity and are identified by color (Figure 3). Mild muscle activity (green) is considered a change of one to two standard deviations from the normative value. Two to three standard deviations are considered moderate muscle activity (blue). Severe readings (red and black) are over three standard deviation changes from the normative value. The patient’s scan identified several areas that were elevated from the normative values. The scan levels were reported as follows: mild at C1, T1, T2 and S1 on the left, moderate at C2 on the right, and a severe level of muscle tension was reported at L5 on the right and hypotonic values in the upper lumbar spine. (Figure 3). The scan showed asymmetry of muscle tension throughout the spine. The levels of most asymmetry were seen in the lumbar region (Figure 4).

In analyzing the lumbar radiographic films, a white, sclerotic mass, indicating calcification, was noted on the lateral lumbar film anterior to L2-L5 vertebrae measuring 8.5 cm in diameter. Due to the size and location of the calcification, the patient was referred to the emergency room (ER) for suspicion of an AAA.

A follow-up phone call with the patient revealed that confusion in the ER had led to the patient not being admitted for further examination. The attending chiropractor made a phone call to the radiology department stressing the potential urgency of the situation. The patient was then contacted and admitted to the hospital. A diagnostic ultrasound (US) confirmed the AAA measuring 8.5 cm in diameter. Additionally, the AAA was hemorrhaging internally. A 12-hour surgery was required to repair the abdominal aorta. The condition has since been resolved and the patient has made a full recovery. The films were later sent out for evaluation by a Diplomate by the American Chiropractic Board of Radiology (DACBR) and were reported unremarkable. No mention of the AAA was mentioned. This stresses the importance that practitioners must be able to proficiently analyze their own radiographs.

**Discussion**

**Risk Factors and Pathophysiology**

Risk factors for AAA must be considered during health history and physical exam procedures. There is a strong correlation of the gender, age, history of smoking, family history of AAA, hypertension, and high cholesterol with an AAA diagnosis. These risk factors must not be ignored when examining a patient with LBP. Aside from acquiring a detailed health history, diagnostic imaging may be the only option for chiropractors to accurately diagnose an AAA prior to rupture. Research has shown the reliability of a physical exam screening for AAA to be significantly low. In 2005, the United States Preventive Services Task Force issued a recommendation for all past and current smokers to receive an ultrasound screening for AAA.

Different factor have been identified as contributors to the pathophysiology of AAA. Histological evidence has suggested that proteolytic mechanisms target the extracellular matrix and break it down. Protein-eroding enzymes called proteinases are responsible for this breakdown. The extracellular matrix can be broken down by increased volume of immune cells and apoptosis (cell death) of the smooth muscle cells in the aorta. Metalloproteinases have been identified as the main proteinases that target elastin and collagen. By destroying elastin and collagen, the aorta loses distensibility and tensile strength. With these cellular changes, the aorta becomes more prone to expansion and, consequently, rupture.

Another mechanism involved in AAA is the influx of immune cells. Inflammation is a part of the aneurysm disease process.
Inflammatory cells that have been found in AAA tissues include macrophages, T-cells, B-cells, dendritic cells, mast cells, and natural killer (NK) cells. Smooth muscle cell (SMC) apoptosis has also been proposed as a mechanism of AAAs. Due to the average age at which AAA typically occurs, SMC apoptosis has been suggested as part of the normal aging process.

Another proposal for the SMC apoptosis is the result of the increase number of NK cells, perforin and Fas receptors found in AAA tissue. NK cells, perforin and Fas receptors have all been accepted as substrates of naturally occurring apoptosis.6

sEMG

By assessing muscle activity, the sEMG scan gives a muscle tonicity or activity reading. To compare differences in muscle tension of the paraspinal muscles, electrode pairs measure the tension levels of 15 anatomical sites bilaterally along the spine. Published normative data and protocols were strictly adhered to during this sEMG scan.11

In conjunction with other exam findings, sEMG scans can be helpful in determining the presence of dysponesis. Dysponesis is a reversible physiopathologic state that produces functional disorders in the human body. Dysponesis has been identified as concealed errors in action potential output from the motor and premotor areas of the cortex as well as the consequences of that output. Dysponesis is associated with vertebral subluxation and is used in chiropractic protocols to help assess for effects of subluxation.9,11-13 Additionally, sEMG scans can help to determine asymmetrical contraction, muscle splinting, severity of a condition, aberrant recruitment patterns, responses of dysaferentation, and response to spinal manipulation.11,13

Paraspinal sEMG scans measure muscle tonicity in microvolts (μV). With the use of handheld electrode paddles, the sEMG reports on a frequency of 25 to 500 Hz. After a scan is complete, the computer analyzes the data in three ways: amplitude, symmetry, and frequency. Amplitude refers to the signal level in microvolts in which higher muscle activity (tension) results in higher amplitude. Symmetry compares the left and right amplitudes of the same anatomical region. Frequency refers to the lower mean or median frequency of a fatigued muscle.11,13

Kent has reviewed the validity of using paraspinal sEMG scans in chiropractic practices and found it to provide reliable quantitative data for assessing muscle activity.11,12 Trial reviews have also been published stating that sEMG scans have a high test-retest and interexaminer reliability.12 Assessing the activity of paraspinal muscle tension has often been considered common practice in chiropractic. Most subluxation theorists agree on kinesiology as part of the subluxation complex.13-16 The literature suggests sEMG scans are a reliable tool to assess for components of vertebral subluxation. Paraspinal sEMG scans are not, however, a diagnostic imaging modality. It is not uncommon to find abdominal calcifications on lumbar views of plain film radiographs.17 As calcification of the abdominal aorta is the mechanism for AAA formation, doctors should be highly suspicious of any calcifications in this area, regardless of the absence of symptoms or red flags. Radiographic examinations have proven to be invaluable in identifying AAAs that otherwise would have been overlooked. Many quality assurance manuals maintain that a doctor’s responsibility for determining whether a radiographic study is warranted should rely on the physical exam results. There are guidelines for practicing chiropractic stating that radiographic studies, as a means to screen patient conditions, are outside the boundaries of medical necessity.18 Information obtained from the exam that warrants a radiographic study includes but is not limited to: recent trauma, restricted ranges of motion, no response to previous care, history of malignancies, and scoliosis.18,19 A recent publication stated nearly all red flag mechanisms of LBP will be detected by physical exam.19,21 However, a retrospective study of 198 AAA patients showed that 52% (103 out of 198 cases) of AAA diagnoses were missed during the physical exam (including health history). In fact, 34% (74 out of 198 cases) were diagnosed while under investigation for a completely separate pathology. Of the 34% of AAAs that were unsuspected, five cases were first detected by plain film radiographic exams. Furthermore, 38% (28 of the 74 AAA cases found by imaging techniques were identified as large enough to be palpable but were still missed during the physical exam. In the group of 74 patients whose AAA was missed on physical exam, LBP was among the top ten symptoms that led doctors to incidentally find the AAA.22 This study is a strong argument for the low reliability of physical exam as a screening measure for AAA and the necessity of radiographic examination for patients that present with LBP.

No red flag information was obtained during the patient’s health history and physical exam of this case. However, the lateral lumbar radiograph showing the calcification of the abdominal aorta proved to be life-saving. Campbell’s retrospective case study on AAAs reviewed 153 AAA patients, of which 52 of the AAAs had ruptured. Campbell reports a mortality rate of 29 of the 52 (55.8%).22 More recent studies have reported up to a 90% mortality rate for ruptured AAA noting that 50-65% die during surgical repair.23-24 In this case, the physical exam failed to raise suspicion for AAA. The radiographic study paired with the due diligence of the attending chiropractor ultimately saved the patient’s life.

Conclusion

Due to the significance of fatalities of AAAs and their common presentation as LBP, all chiropractors should be concerned when a patient presents with LBP. It is vital to understand that not all LBP is mechanical. A high-velocity, low-amplitude force commonly used in chiropractic adjustments and manipulations is contraindicated in the presence of an AAA.

Furthermore, the risk factors and epidemiology of AAAs categorize the condition as more likely in an aging population. As such, special precautions must be taken by chiropractors when treating patients who are over the age of 50, are past or
current smokers, and present with LBP. Although more research is needed on the implications of spinal manipulation in the presence of an AAA, this case exemplifies the vital nature of ruling out emergency conditions before treating at-risk populations and the value of radiographic examinations prior to chiropractic care. Also, this case adds to an already extensive list of peer-reviewed references further validating CBP® protocol for safe and effective chiropractic care.

References:

Figure 1: Lateral Lumbar Film

Figure 2: Anterior to Posterior Lumbar film
Figure 3: sEMG

Figure 4: sEMG Asymmetry