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Clinical Cases and Poster Forum

ABSTRACTS

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Oral Clinical Case Presentations

Clinical Case Poster Presentations

Variations on a Theme – Pure Sensory Strokes

Whitley Figge, MS, OMS-III[1,2;] Thomas C. Varkey, MD, MBA, Med[2,4]; Luke Kloft, BS[1,2]; Tamim Sultani, MD, [3,4]; & Andrei Alexandrov, MD, [2,4]

1. **A.T. Still University College of Osteopathic Medicine**
2. **Banner University Medical Center – Phoenix, Department of Neurology**
3. **Banner University Medical Center – Phoenix, Department of Radiology**
4. **The University of Arizona, College of Medicine – Phoenix, Phoenix, Arizona**

Emails:
Whitley Figge: whitleyfigge@atsu.edu
Thomas C. Varkey: TVarkey@Utexas.edu
Luke Kloft: sa205069@atsu.edu
Tamim Sultani: SultaniTim@gmail.com
Andrei Alexandrov: alexandrov@arizona.edu

Abstract

Cerebrovascular accidents or strokes are one of the leading causes of death and disability in the United States and can present in a variety of ways depending on which part of the brain is impacted. The traditional presentation of a stroke involves motor deficits and speech impairment but in some instances, strokes may be purely sensory. Often these strokes are in the thalamus which serves as a relay center for motor, sensory, and limbic pathways. Due to the presence of multiple tracts and communication channels, an infarct in the thalamus can lead to different constellations of sensory symptoms. Two clinical conditions that fit this vignette are Cherio Oral Pedal Syndrome where a patient experiences numbness of the corner of the mouth, hand, and foot, and Thalamic Pain Syndrome where a patient has severe pain and altered sensation in ipsilateral areas of their body. Herein we present two patients presenting with the above symptoms as a result of suffering lacunar infarcts in the right thalamus visualized on MRI. One patient is an 86-year-old female with a medical history of essential tremor status post deep brain stimulator who presented with left-sided numbness in the corner of the mouth, over the hand, and in the foot for 12 hours. The other patient is a 47-year-old man with a medical history of obesity and atrial fibrillation who presented with left-sided numbness and pain which started 6 hours after the initial numbness in the same areas. In both cases aside from diminished or altered sensation, the patients had grossly normal physical exams. The lack of additional symptomatology and evidence of stroke only visible on MRI highlights the significance of utilizing neuroanatomy and somatosensory tracing to determine the origin of the infarct.

Introduction

Strokes are one of the leading causes of death for Americans and significantly contribute to the cost burden of healthcare services[18]. Stroke education is becoming more widespread and has been central to many health initiatives with recognition, intervention, and follow-up having a significant impact on morbidity and mortality[18]. However, not all strokes are created equal. Some involve the traditional symptoms recognized by the public of sudden numbness, change in vision, facial asymmetry, confusion, and change in speech, but others may have an atypical presentation dependent on where the stroke occurs[9,18]. A subset of strokes involves deeper structures of the brain and are categorized as lacunar strokes[1,3]. These have the possibility of presenting as purely sensory disturbances which may have delayed recognition leading to

delayed diagnosis and intervention[1,3,]. One structure commonly affected in lacunar strokes is the thalamus[1,3,5,19]. The thalamus is a paired structure of the diencephalon located near the center of the brain and serves as a relay center for motor, sensory, and limbic pathways[14]. If blood flow to the thalamus is disrupted any of these pathways can be affected. In certain instances where the nuclei of the thalamus that relay sensory signals are impacted, a patient may experience a purely sensory stroke[1,14]. They may present without typical findings of a stroke discussed above making their diagnosis difficult which can lead to misdiagnosis or delayed treatment of the patient.
Two clinical conditions that fit this vignette are Cherio Oral Pedal Syndrome where a patient experiences numbness of the corner of the mouth, hand, and foot, and Thalamic Pain Syndrome where a patient has severe pain and altered sensation following stroke[2,3,5,6,12,13]. It has been found that either syndrome may spontaneously resolve or improve but some patients will require lifelong management of symptoms[3,10]. Because of the rarity of these syndromes and their localization to only a few areas of the anatomy of the brain pathways, this serves as both a primer on the anatomy and a reminder of clinically relevant areas for the clinician to ensure that they are not missed during the review of the imaging with neuroradiology[15,16]. Altered sensation and perception can be devastating on their own, but not identifying that a patient had a stroke in the first place can be detrimental to their future health if proper preventative interventions are not put in place.

Case Presentation

COPS

History and Physical Exam

Our first patient is an 86-year-old woman with a medical history of essential tremor s/p deep brain stimulator, recurrent urinary tract infections, hypertension, hyperlipidemia, and asthma who presents to our comprehensive stroke center with a chief complaint of left-sided numbness in the corner of the mouth, over the hand, and in the foot for 12 hours. She states that she had noticed it the previous night, thought that the symptoms were odd, and made the executive decision to try to sleep it off, hoping it would go away. Upon awakening, the patient noted that she was struggling to move her foot in three-dimensional (3D) space and as a result was dragging her foot to stably walk to the bathroom. The patient endorsed that the numbness was only in the

hand, foot, and corner of her mouth, but denied weakness, numbness in other areas, joint pain, muscle pain, or visual changes.

When asked, the patient did note experiencing migraine headaches for the last 4 months, refractory to Tylenol and ketorolac, with intermittent nausea, and associated photophobia and phonophobia. However, in this particular instance, the patient stated that she was not currently experiencing her migraine symptomatology and denied having any previous history of auras. The patient denied any constitutional, cardiovascular, respiratory, gastrointestinal, genitourinary, or psychiatric symptoms.

On physical examination, blood pressure was elevated to 163/128 mmHg, respiratory rate was 10 breaths/min, and her oxygenation on room air was 94%. Other vitals were within normal limits. The patient was not in acute distress and was sitting up in the CT scanner answering questions appropriately. Cranial nerve V presented with diminished sensation around the corner of the left side of the mouth. The rest of the cranial nerve exam was normal. Bilateral strength and reflexes were normal. Sensation examination indicated numbness and paresthesia of the left V2 distribution, left C6-8 distribution and left S1-2 distribution. The patient had normal cerebellar function. A stroke alert was called and a patient assessment was completed. The patient's last known well time was 21:00 with a stroke alert called at 8:57 the next morning when she presented with complaints that the emergency room physician noted to likely be a stroke syndrome.

Differential Diagnosis

In this particular case, the differential for the cause of the patient's symptoms is fairly large with a number of the possibilities being directly related to causes of nerve damage. These include stroke, deep brain stimulator malfunction, brain tumor, cavernous hemangioma, iatrogenic injury, complicated migraine, transient ischemic attack, multiple sclerosis, vitamin b12 deficiency trigeminal nerve palsy, giant cell arteritis, peripheral nerve injury, spinal stenosis, and adverse effect of medication. However, the vast majority of these could be easily ruled out due to the patient's rapid onset of symptoms. Because of the risk factors of hypertension, history of migraine headaches, her deep brain stimulator, and hyperlipidemia, the specter of stroke rose in the differential.

Labs and Imaging

Due to the patient's symptoms and presentation, the stroke team was appropriately called. Per protocol, a CT head without contrast and a CT angiogram of the head and neck were performed and both were unremarkable. After verifying with Medtronic that the patient could safely undergo MRI, an MRI diffusion-weighted imaging (DWI) scan was performed. The MRI DWI indicated ischemic stroke localized to the right thalamus, likely due to small vessel disease. The significant MRI images are provided in Figure 1. The patient also had a transthoracic echocardiogram while in our care that revealed a 68% ejection fraction without evidence of intraarterial septal defect.

Diagnosis and Treatment

Based on the MRI imaging, the history, and the physical examination, the patient was diagnosed with a small vessel stroke likely secondary to her deep brain stimulator due to the stroke's conspicuous location. Her symptomatology fits the classical cheiro-oral-pedal syndrome secondary to a lacunar infarct localized to the right thalamus on a DWI MRI of the brain. Due to the timeframe in which she presented, approximately 12 hours after the onset of symptoms, tPA was not a treatment option[6,8,9].

Per stroke protocol, she was started on 40 mg atorvastatin and 81 mg aspirin[9]. Due to her 4-month history of migraine headaches, the stroke team began a trial of 40 mg propranolol for prophylaxis of future headaches. She was monitored during the stroke workup in order to act quickly if she were to have another stroke and set up with close follow-up for a workup of her migraine headaches. Because of the location of the stroke and its presentation, the patient was given further instructions on the need to return for any neurological symptoms and discharged to home.

THALAMIC PAIN

History and Physical Exam

Our second patient is a 47-year-old man with a history of obesity, type 2 diabetes mellitus, hypertension, obstructive sleep apnea, and paroxysmal atrial fibrillation reportedly non-adherent with rivaroxaban who presented with left-sided numbness and pain which started 6 hours after initial numbness in the same areas. At the bedside, the patient reported left-sided symptoms described as shooting pain in the left forehead, left maxilla, left neck, from midline chest to left

axilla, and in the left thigh. He described the numbness as "feeling as if the areas are swollen" and "weird."

He reported an associated severe, stabbing pain headache, present bilaterally behind his eyes. He denied any associated weakness, nausea, vomiting, blurry vision, photophobia, or phonophobia. He noted no symptoms on the right. His headache was present for an hour before resolving and then returning. He denied any fevers, chills, diarrhea, or dysuria. During the examination, the patient was fully alert and oriented with normal affect and no acute distress. He was speaking in full, coherent sentences with intact repetition, fluency, and comprehension. Cranial nerve testing revealed diminished facial sensation to light touch in the left forehead, left cheek, and left neck but intact in the posterior and temporal head. The remainder of cranial nerve testing was normal. He had diminished sensation to light touch in the left forehead, left cheek, left neck, left chest (from the midline to left axilla), and left thigh in the anterior but not posterior region, otherwise intact sensation in arm and legs throughout. Coordination was intact and the remainder of the physical exam was unremarkable.

The patient states his atrial fibrillation was diagnosed in April 2023 and he was prescribed rivaroxaban, but he did not follow up with cardiology or take medication regularly due to his busy work schedule. He also endorsed a history of a “grand mal” seizure in childhood and again in his 20s for which he was briefly on phenytoin. He underwent an EEG but was told he did not have epilepsy and phenytoin was discontinued.

Differential Diagnosis

Due to patient presentation and symptom complaints, the differential diagnosis includes but is not limited to stroke, transient ischemic attack, multiple sclerosis, brain abscess, peripheral neuropathy, and trigeminal nerve palsy with the most likely diagnosis being stroke leading to central pain syndrome or thalamic pain syndrome.

Labs and Imaging

A computerized tomography (CT) head and Computerized Tomography Angiogram (CTA) of the head and neck were obtained which were negative for vessel stenosis. A magnetic resonance image (MRI) of the brain was then performed which revealed an acute punctate lacunar infarct in the right thalamus as well as microvascular ischemic white matter disease and tiny remote lacunar infarct in the left basal ganglia. This can be seen in Figure 2. The patient’s hemoglobin A1C was elevated at 6.1% and his LDL was elevated at 71 mg. His other labs were within

normal limits. Because of the likely etiology of the stroke, medium vessel disease versus atrial fibrillation, he underwent testing for an acute thrombus in the heart.

Diagnosis and Treatment

The patient was diagnosed with a thalamic stroke and secondary thalamic pain syndrome. He was started on standard dose rivaroxaban, atorvastatin 40 mg, and aspirin 81 mg daily to prevent further strokes[9]. This method was chosen secondary to SAMPRIS data recommending DAPT, with the caveat that his atrial fibrillation would have necessitated triple therapy so double therapy instead was utilized. For pain management, 100 mg gabapentin three times a day was utilized to provide relief with increased doses being available as necessary based on symptomatology[11]. Three months after his stroke, the patient reported complete amelioration of the pain, with the caveat of interspersed episodes of recurrence of symptoms. Education on recrudescent was provided at that time.

Discussion

These patient cases highlight several key concepts. First, Cheiro-oral-pedal syndrome (COPS) and Thalamic Pain Syndrome are largely clinical diagnoses that are supported by imaging studies raising the specter of stroke within the differential[3,4,16,19]. The leading causes of COPS and Thalamic Pain Syndrome include stroke or hemorrhage in the midbrain, pons, thalamus, or medulla[3,4,16,19]. The key to localizing lesions in these syndromes is similar to any other neurological pathology – know neuroanatomy. The sooner a lesion is localized and identified utilizing neuroanatomy knowledge and advanced imaging, the sooner the treatment can begin. In these cases, the duration of their symptoms put them outside the optimal window to use tissue plasminogen activator (tPA) which is indicated within 4.5 hours of the patient's last known well time, however, neuroanatomy remains key in the diagnosis[8,9]. A definitive diagnosis can indicate additional treatment options to diminish the chances of future complications.

What these patients have in common is the area of their thalamic infarct. The thalamus is situated in a way where various nuclei are clustered together characterized by cohesive function[14]. The area of interest in these patients is the ventral posterior nucleus. Sensory information from a patient's environment is transmitted along the spinothalamic tract and dorsal column depending on the type of stimulus[14]. These signals then decussate in the thalamus in the ventral posterolateral nucleus (VPL)[14]. These tracts carry sensory information from the upper and lower

extremities which run adjacent to each other in the cuneate fasciculus and gracile funiculus[14]. Adjacent to this is the ventral posteromedial nucleus (VPM) where the signals from the second-order neuron of the trigeminothalamic tract are transmitted[14]. Therefore, a lesion resulting in paresthesias of the corner of the mouth and ipsilateral hand and foot without motor impairment is likely located around the VPM and VPL of the thalamus. Similarly, a lesion resulting in altered sensation of the forehead, maxilla, neck, chest, axilla, and thigh without motor impairment is likely located around the VPL. In this case, specifically, the ability to correctly interpret tactile information was adversely affected leading to the patient experiencing shooting pain, numbness, and a feeling of swelling. An interesting difference between the two cases is that the COPS patient had non-painful paresthesia while the Thalamic Pain patient had an altered perception of tactile stimuli leading to pain sensations. This difference is most likely due to the pinpoint location of the infarct in relation to the somatosensory pathways – efferent versus afferent. While neither patient presented with typical stroke symptoms, they were recognized as likely stroke patients and underwent appropriate workups due to astute clinical recognition. The differential remained broad due to the purely sensory symptoms and included stroke, brain tumor, cavernous hemangioma, iatrogenic injury, complicated migraine, transient ischemic attack, multiple sclerosis, vitamin b12 deficiency, trigeminal nerve palsy, giant cell arteritis, peripheral nerve injury, spinal stenosis, and adverse effect of medication. Through appropriate workup the differential was narrowed to pure sensory stroke due to lack of other symptoms, largely normal test results and vitals, and later imaging which confirmed the location. The thalamic infarcts were unable to be visualized on CT and instead required MRI which necessitated interpretation by a neuroradiologist for appropriate localization[15]. It should also be noted that the cause of stroke in the COPS patient was suspected to be small vessel disease related to the presence of her deep brain stimulator, a known complication[7,13]. Conversely, it was suspected the cause of stroke in the Thalamic Pain patient was medium vessel disease associated with his history of atrial fibrillation.

Once appropriately diagnosed, the patients were treated based on their presentations despite having lesions in similar locations. The COPS patient was treated with migraine prophylaxis, atorvastatin, and aspirin to decrease the risk of future stroke. The Thalamic Pain patient was treated similarly with atorvastatin and aspirin but also required rivaroxaban due to his atrial

fibrillation and gabapentin due to his altered pain perception. The COPS patient had purely paresthesias so did not require pain modulation medication.

An alternative treatment option for both patients when assessed from an osteopathic perspective could include cranial and somatic osteopathic manipulative treatment (OMT)[17]. As discussed above, the thalamus is a relay center for motor, sensory, and limbic pathways[14]. For these reasons, it was determined that the thalamus can modulate pain through its processing of nociceptive information before transmission to the cortex[4]. It could then be possible to influence thalamic function through cranial OMT, including compression of the fourth ventricle, lifts, suture spread, membranous balance, and decompression, which has been shown to affect interoceptive networks and functional brain connectivity[17]. It has also been shown that cranial OMT influences cerebral perfusion which could be considered once a patient is deemed stable[17]. It is possible since the patients experienced ischemic strokes prior to symptom onset that later in rehabilitation if the cerebral perfusion is addressed, the symptoms could be positively impacted. In addition, it has been proven that changes in autonomic function can manifest somatically which would likely be present in patients experiencing sensation deficits[10]. Therefore, treating a patient somatically to dampen the sympathetic response may also yield a positive outcome[10].

Conclusion

These patient cases highlight the importance of symptom recognition and neurologic lesion localization. Pure sensory strokes are not common, but when the lesions are examined critically the symptomatology makes sense; the somatosensory system decussation and relay patterns just need to be traced. COPS and Thalamic Pain Syndrome are rare diagnoses but can be identified clinically based on their characteristic patterns of altered sensation through this method. Early clinical identification gives rise to early intervention which positively impacts clinical outcomes. If appropriate, OMT techniques, such as cranial, can be used as an adjunct therapy to influence cerebral perfusion and interoceptive networks.

Acknowledgements/Disclosures

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Graphic Elements

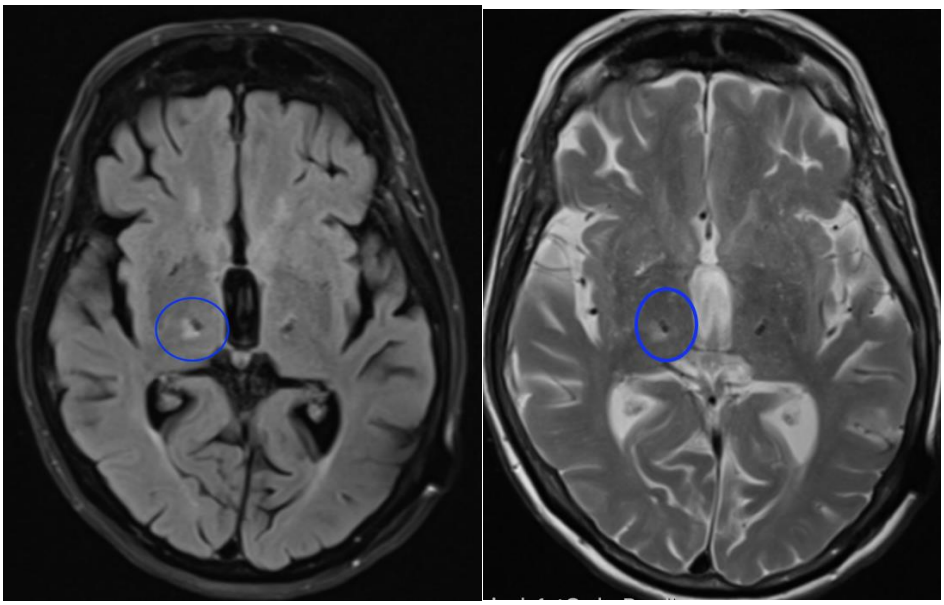

Figure 1. T2 Flair and ADC Imaging of the lesion located in the right-sided thalamus in patient presenting with COPS

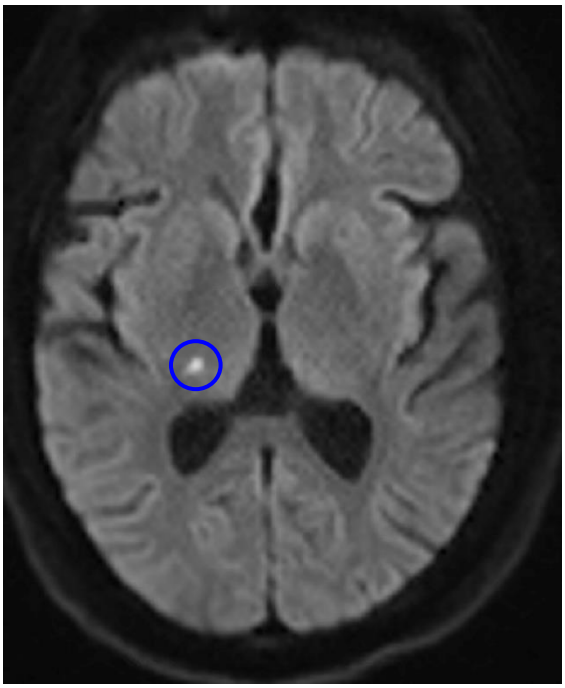

Figure 2. T2 DWI MRI Thalamic Lesion that led to Thalamic Pain Syndrome

Conflict of Interest:

Whitley Figge: Whitley Figge declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Thomas C. Varkey: Thomas Varkey declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Luke Kloft: Luke Kloft declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Tamim Sultani: Tamim Sultani declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Andrei Alexandrov: Andrei Alexandrov declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Beyond the Scalpel: Exploring Mindfulness Approaches and Narrative Inquiry for Failed Back Surgery Syndrome

Ritika Gupta
OMS-III, Arizona College of Osteopathic Medicine, Midwestern University
19555 N. 59th Ave., Glendale, AZ, 85308
ritika.gupta@midwestern.edu

Sam Safavi-Abbasi, M.D
Neurosurgeon, Yavapai Regional Medical Center
1003 Willow Creek Rd., Prescott, AZ, 86301
sam.safavi-abbasi@commonspirit.org

Charles Finch, D.O
Chair of Integrative Medicine, Arizona College of Osteopathic Medicine, Midwestern University
19555 N. 59th Ave., Glendale, AZ, 85308
cfinch@midwestern.edu

Abstract

Failed Back Surgery Syndrome (FBSS) is a condition that is characterized by persistent or recurrent low back pain after spine surgeries. It is a prevalent condition that affects a significant proportion of adults in their lifetime, ranging from 51% to 84%. The increasing rates of back interventions in the United States have contributed to a noticeable rise in Failed Back Surgery Syndrome prevalence. This condition is marked by its complexity and heterogeneity, which presents ongoing challenges for effective treatment strategies.

This case report provides details about a patient who has been experiencing chronic back pain for 15 years despite exhaustive adherence to guideline-based conservative and surgical interventions. In this case, we employed diverse screening questionnaires and a somatic-based approach to investigate an association between the patient's pain and adverse childhood experiences. This approach led us to hypothesize that psychosocial factors, such as adverse childhood experiences, may have played a significant role in the onset and persistence of the patient's Failed Back Surgery Syndrome.

This case underscores the critical importance of addressing psychosocial factors that may influence the onset and persistence of Failed Back Surgery Syndrome. It highlights the need to adopt a holistic approach in Failed Back Surgery Syndrome management, emphasizing the multifactorial nature inherent to this syndrome. By taking a more comprehensive view of the patient's condition, healthcare providers may be able to develop more effective treatment strategies that address the physical, psychological, and social aspects of Failed Back Surgery Syndrome.

Keywords: *Failed Back Surgery Syndrome, osteopathic approach, low back pain, adverse childhood experience, biopsychosocial*

Introduction

Failed Back Surgery Syndrome (FBSS) manifests as persistent or recurring low back pain, often accompanied by or without sciatica, following one or more spine surgeries. There are now over a million total spinal surgeries done yearly in the past decade, increasing the prevalence of FBSS in the United States.[1] FBSS is reported to affect up to 40% of patients following back surgery.[2] Diagnosing and treating FBSS can pose significant challenges, as its contributing factors fall into broad categories encompassing pre-surgery, during surgery, and post-surgery stages.[2,3] The focus of the case report shifts towards a patient who, despite undergoing spinal surgeries, continues to endure low back pain that adversely impacts their daily activities and quality of life. The report meticulously details the patient's medical history, incorporating any pre-existing conditions that might have played a role in the development of FBSS. Emphasizing the attempts made before the initial consultation with our clinic, the report elucidates various treatments and managements. Furthermore, it underscores the necessity of addressing psychosocial factors contributing to the onset and persistence of FBSS. Ultimately, the case report offers valuable insights into adopting a holistic approach when managing a patient with FBSS, shedding light on the multifactorial nature of this intricate syndrome.

Case Presentation

An 80-year-old Hispanic male with a medical history including atrial tachycardia, benign hypertensive heart disease without CHF, gout, greater trochanteric bursitis of the left hip, jackhammer esophagus, stroke, DVT, hypertension (HTN), and sleep apnea presented to our clinic in 2022 with a chief complaint of persistent back pain despite undergoing numerous back and pelvic surgeries.

The patient, a former firefighter, was referred to neurosurgery after multiple neck, shoulder, orthopedic, and other procedures aimed at alleviating pain. His extensive surgical history includes back disorder surgery, rotator cuff surgery (1998), total knee replacement surgery (2009), thumb surgery, L4-L5 transforaminal lumbar interbody fusion with spacer placement (2011), total hip arthroplasty s/p hip injection failure (2018), Nervo thoracic spinal cord stimulator s/p internal post-generator removal (2019), L5-S1 Anterior Lumbar Interbody Fusion (ALIF) (2022), L2-L4 Lateral Lumbar Interbody Fusion (LLIF) (2022), L3-S1 Minimally Invasive Screw (MIS) percutaneous screw placement (2022), and removal of L4-L5 hardware (2022).

During the initial visit with our neurosurgery clinic, the patient expressed frustration with conservative and medical management for his back and lumbar radicular pain. Despite various specialists and extensive imaging, an initial MRI revealed degenerative disc and joint disease with spinal canal and neural foraminal narrowing from L1-S1 (Figure 1). Contrary to expectations, pain persisted post-procedures (Figure 2). Subsequent to the 3rd and 4th back surgeries, CT and MRI results exhibited the successful alleviation of L1-S1 disc compression and neural foraminal stenosis (Figure 3).

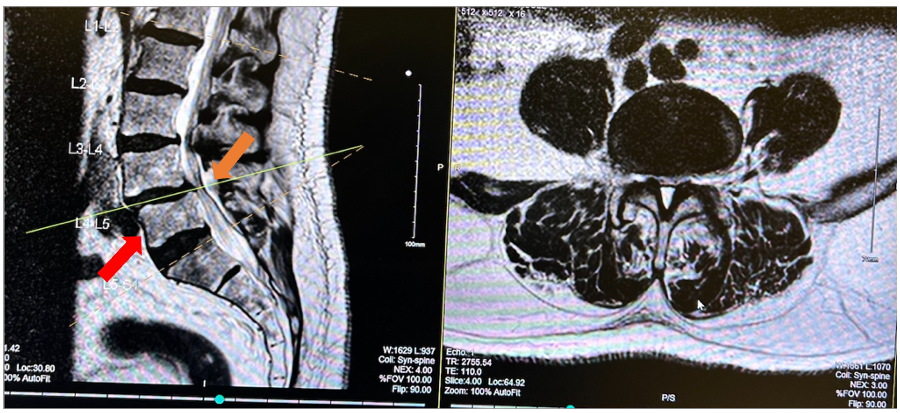

Figure 1. Sagittal and Axial MRI of Spine Before Back Surgery in 2010. MRI shows degeneration of discs (red arrow) and stenosis of neural foraminal narrowing from L1-S1 (orange arrow).

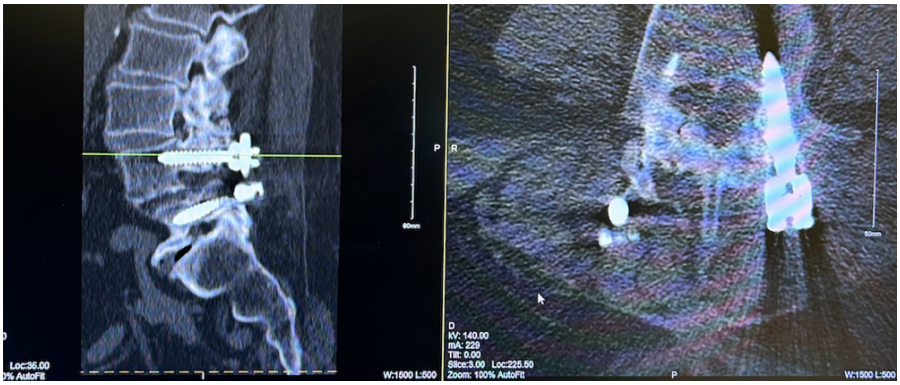

Figure 2. Sagittal and Axial CT Post-Surgical Intervention in 2010.

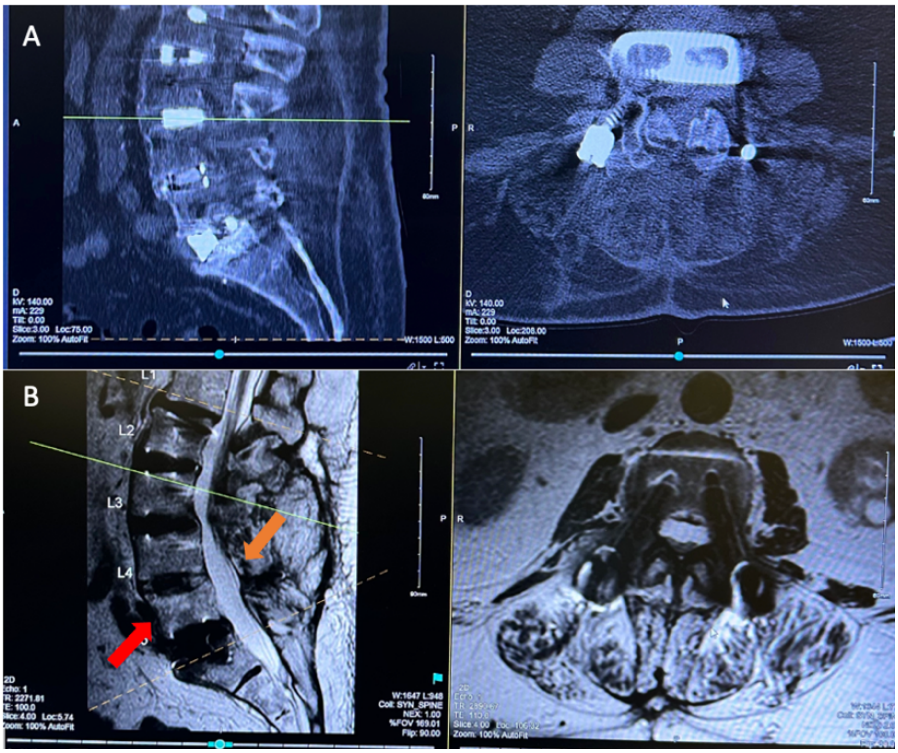

Figure 3. (A) Sagittal and Axial CT and (B) Sagittal and Axial MRI of L1-L5 with instrumentation present in all lumbar levels post 3rd and 4th back surgery.

Considering the heterogeneous nature of chronic pain, a somatic-based approach was adopted, delving into the patient's biopsychosocial background for a comprehensive understanding. We conducted a thorough assessment, including the Pain Catastrophizing Scale (PCS), Health Questionnaire (EQ-5D-5L), 12-question Short Form Health Survey (SF12), Adverse Childhood Experience (ACE) questionnaire, and Oswestry Low Back Pain Disability Questionnaire. These assessments revealed a multifaceted impact on the patient's physical and mental well-being.

To address his FBSS holistically, we proposed incorporating conversational therapy, a chronic pain program, mindfulness training, physical exercise, and self-acceptance of chronic pain. From October 2022 to August 2023, the patient received counseling during neurology clinic visits and continued physical therapy. Subjectively, the patient experienced some alleviation of his pain; however, he began to report a

shift of pain from his back to his hip by September 2023. Following unsuccessful interventions for right hip pain, including injections and SI joint fusion, the patient became discouraged.
After extensive discussions, the patient agreed to revisit our holistic treatment plan. Despite challenges with mindfulness practice adherence, the patient has become more open-minded, acknowledging the limitations of intensive medical interventions. Although progress has been gradual, our most recent visit in the current year revealed a reduction in pain and an improvement in the impact of his biopsychosocial factors on his chronic pain, as confirmed by the repeat of the screening questionnaires.

Discussion
The 80-year-old Hispanic male presented in this case has been grappling with persistent back pain despite undergoing an extensive history of medical interventions and surgeries. This discussion delves into the multifaceted aspects of the case, with a focus on various potential factors such as the impact of adverse childhood events (ACEs) on chronic pain, inadequacies of previous surgical interventions, and the prospects of adopting an osteopathic approach and holistic measures for enhanced pain management.

The patient disclosed a traumatic childhood marked by familial struggles with alcoholism and violence. Given the multi-casual nature of chronic complex pain, it is important to consider psychological factors such as ACEs. Research has shown that there is a potential connection between ACEs and an elevated risk of persistent pain in adulthood.[4] Therefore, it is crucial to understand the psychosocial dimensions of a patient's history as it may offer essential insights into the origin and perpetuation of his pain.

A biopsychosocial approach to chronic illness recognizes the interplay between biological, psychological, and social factors in shaping an individual's experience of pain.[5] In the context of our case, understanding the impact of adverse childhood events (ACEs) on the patient's chronic pain underscores the importance of psychological factors in contributing to and perpetuating pain.[4] This approach allows healthcare providers to tailor interventions that address the physical symptoms and the psychological and social dimensions of the patient's pain experience.

Despite an exhaustive array of surgical interventions, the patient's persistent pain points to the possibility of failed back surgery syndrome (FBSS). Therefore, it is essential to critically reflect on the patient's surgical history, raising questions about the decision-making process that led to multiple interventions. The surgeons' oversight in recognizing potential red flags, indicating the patient might not be an ideal candidate for surgery, highlights the importance of a comprehensive evaluation that extends beyond anatomical considerations.[1]

Taking a transdisciplinary approach to chronic pain further enhances the understanding and management of conditions like failed back surgery syndrome (FBSS). A transdisciplinary model integrates knowledge and expertise from various disciplines, fostering collaboration among healthcare professionals to develop a holistic, patient-centered care plan.[6] In the case of FBSS, combining insights from neurosurgery, osteopathy, psychology, and other relevant fields can lead to a more comprehensive understanding of the patient's condition, allowing for nuanced and effective interventions.

Reevaluating the case through an osteopathic lens becomes imperative, considering the patient's history of unsuccessful surgeries. The osteopathic approach emphasizes a holistic understanding of the body's interconnectedness and the importance of musculoskeletal balance. By addressing somatic dysfunctions and considering the whole patient, osteopathic interventions offer novel avenues for managing FBSS, focusing on restoring structural integrity and function. For patients like ours who have chronic back pain, we could implement osteopathic manipulative techniques (OMT), such as direct myofascial release, counterstrain, and muscle energy.[7]

Incorporating mindfulness meditation into the patient's care plan is pivotal in addressing chronic pain. Mindfulness practices, rooted in awareness and acceptance of the present moment, have effectively reduced pain intensity, and improved overall well-being.[8] Coupled with narrative medicine, which involves the patient's storytelling and reflection, mindfulness becomes a powerful tool for exploring pain's emotional and psychological dimensions. This combination facilitates a deeper understanding of the patient's narrative, fostering resilience and promoting positive changes in coping mechanisms.

As we navigate the complex landscape of managing chronic pain, it is crucial to adopt a patient-centered approach--this involves recognizing and addressing the various aspects of pain through biopsychosocial, transdisciplinary, osteopathic, and holistic perspectives to develop a more comprehensive and tailored strategy. The ultimate goal is to provide long-term relief and enhance the overall quality of life for individuals dealing with the complexities of chronic pain. This case demonstrates the intricate relationship between adverse childhood experiences, challenges in making surgical decisions, and the potential benefits of using osteopathic and holistic approaches to manage chronic pain.

Acknowledgment
I am writing to express my sincere gratitude to Dr. Safavi-Abbasi, a Neurosurgeon at Yavapai Regional Medical Center, for providing me with the invaluable opportunity to write this case report. His guidance, support, and care were instrumental throughout the process. Additionally, I extend my thanks to Dr. Finch, the Chair of Integrative Medicine at AZCOM, for his continuous support and encouragement during this research endeavor. Their expertise and mentorship have significantly contributed to the completion of this work. I also sincerely appreciate the patient for generously allowing us to share his story. The openness and trust demonstrated by the patient have enriched the depth and impact of this case report.

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Graphic Elements

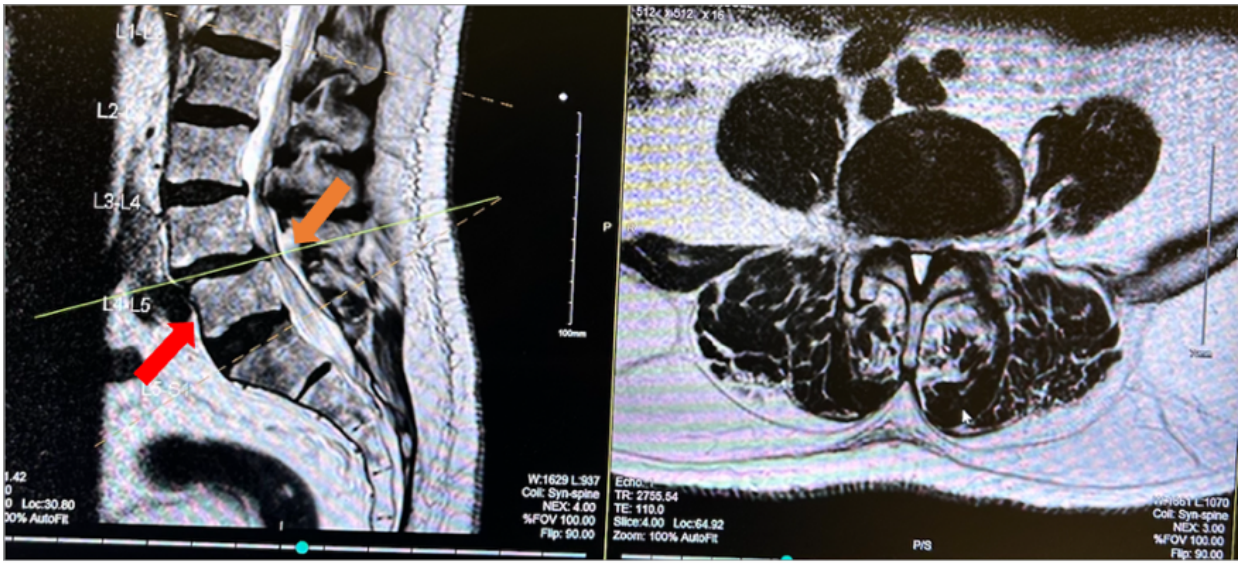

Figure 1. Sagittal and Axial MRI of Spine Before Back Surgery in 2010. MRI shows degeneration of discs (red arrow) and stenosis of neural foraminal narrowing from L1-S1 (orange arrow).

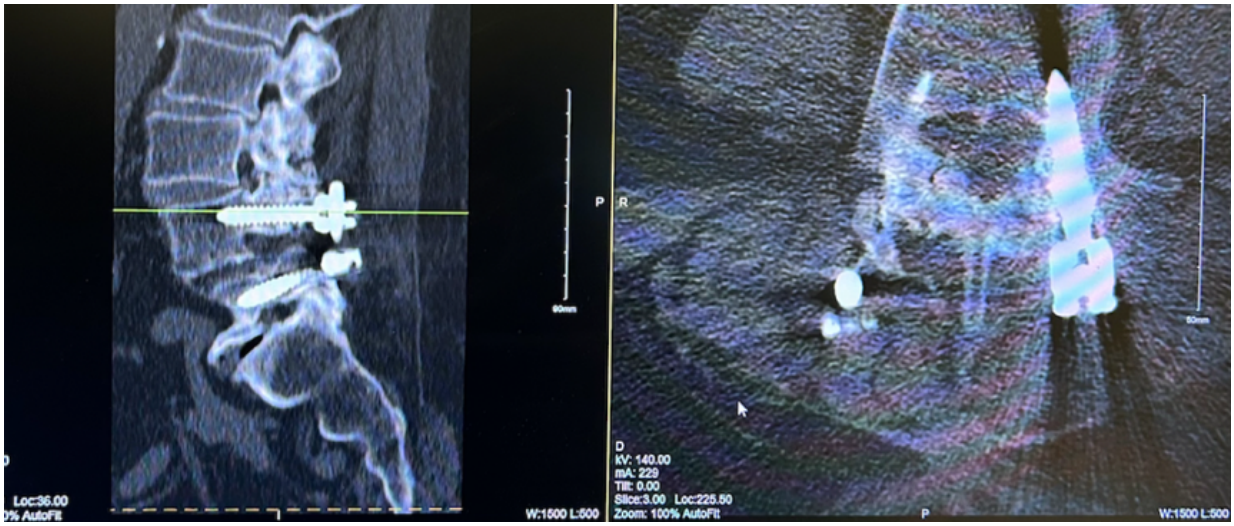

Figure 2. Sagittal and Axial CT Post-Surgical Intervention in 2010.

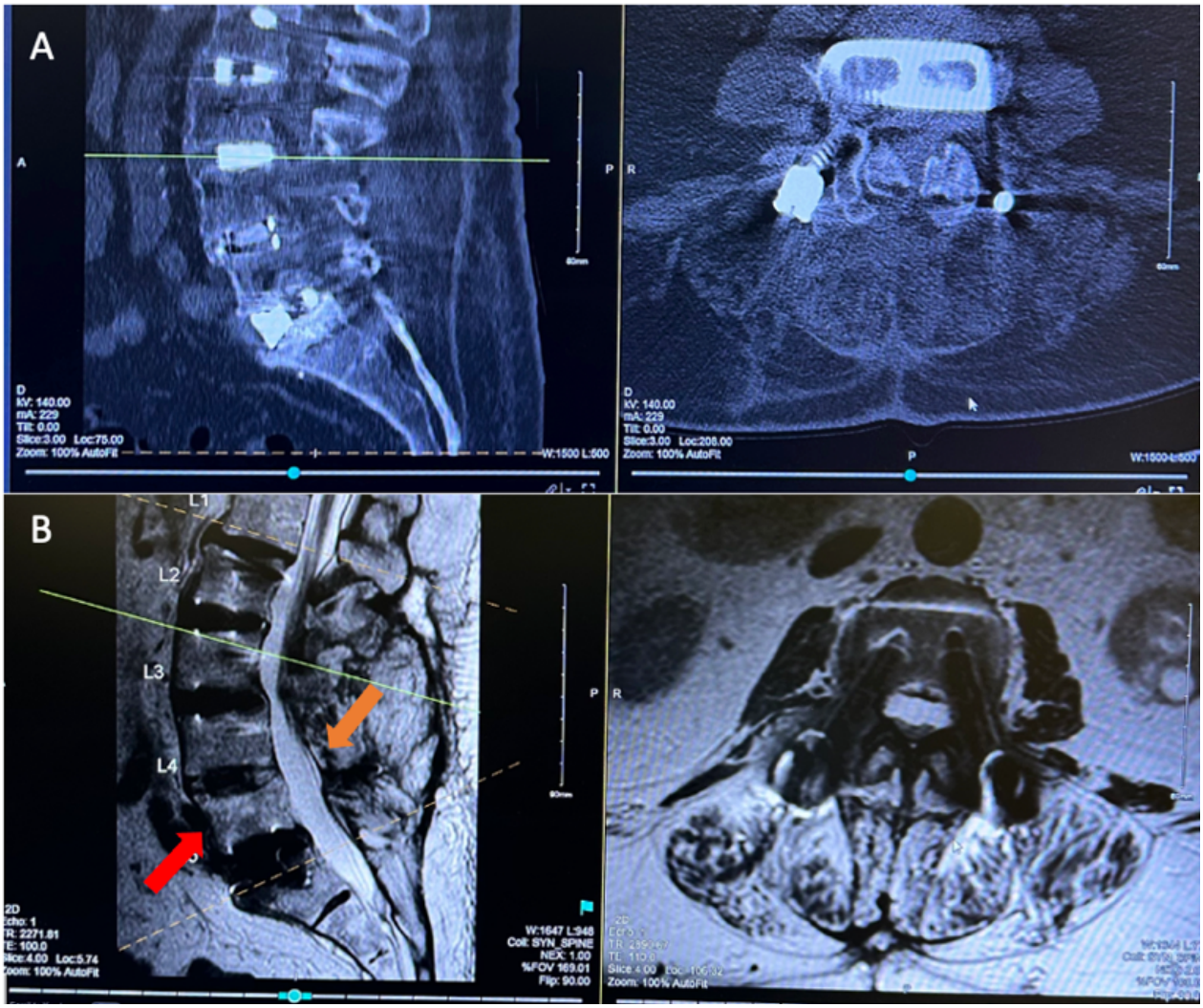

Figure 3. (A) Sagittal and Axial CT and (B) Sagittal and Axial MRI of L1-L5 with instrumentation present in all lumbar levels post 3rd and 4th back surgery.

AOMA 2024 Oral Clinical Case Presentation

Title: Advanced Merkel Cell Carcinoma in Setting of Pembrolizumab Therapy for Metastatic Squamous Cell Carcinoma

Authors: Henry Jeon, MS-III[1], John Ashurst, DO PhD[1], Keith Mackenzie, DO[2,]

[1] Midwestern University Arizona College of Osteopathic Medicine, 19555 N 59th Ave, Glendale, AZ 85308

[2] Mackenzie Dermatology, 3190 Clearwater Dr., Prescott, AZ 86305

Emails: henry.jeon@midwestern.edu; jashur@midwestern.edu; macdermdoc@gmail.com

ABSTRACT

Merkel cell carcinoma is a neuroendocrine tumor commonly found in patients of old age, immunosuppression, and extensive ultraviolet exposure. Characterized by its high recurrence, early metastasis, rapid growth, and poor prognosis, Merkel cell carcinoma is currently managed via definitive excision followed by radiation therapy or immunotherapy.[1-3] Pembrolizumab, a programmed cell death receptor 1 inhibiting monoclonal antibody, is an immunotherapy agent approved for treatment of Merkel cell carcinoma.[4] A rare adverse reaction termed hyperprogressive disease is a phenomenon in which a malignancy paradoxically experiences accelerated growth after immunotherapy initiation.[5-6] It is explained by two leading pathophysiological theories - adaptive immunity to immunotherapy or modified innate immunity, either of which foster pro-oncogenic environments.[7] Numerous case reports and studies explore hyperprogressive disease but fail to address application of this concept in different disease models such as newly arising tumors or cancer phenotype alteration.[8] We report an 86-year-old female patient receiving pembrolizumab treatment for metastatic squamous cell carcinoma who presented with a 3.5 x 3.5 x 2.0 cm Merkel cell carcinoma on her scalp, confirmed by histopathology. On her five-week follow-up post-resection, the patient presented with two new larger lesions of Merkel cell carcinoma around the same area of her scalp, the first measuring 8.0 x 6.0 x 4.0 cm and the second measuring 5.0 x 4.0 x 3.0 cm. The patient's paradoxical and aggressive development of Merkel cell carcinoma while receiving pembrolizumab for a different metastatic cancer is explained by the hyperprogressive disease model applied to a de novo malignancy and is the first of its kind reported in literature.

INTRODUCTION

Merkel cell carcinoma (MCC) is a neuroendocrine tumor that originates from a slow-acting mechanoreceptor in the stratum basale.[1] Patients of old age, immunosuppression, and extensive UV exposure are at increased risk of developing MCC, which is characterized by its high recurrence, early metastasis, rapid growth, and poor prognosis.[1-2] Tripling its incidence in the past 15 years, MCC has been of increasing dermatological concern and is currently managed via sentinel lymph node biopsy with definitive excision, followed by radiation therapy or immunotherapy.[1-3]

Initially implemented for treatment of refractory melanoma, pembrolizumab is FDA approved for the treatment of squamous cell carcinoma (SCC), MCC, and numerous advanced cancers.[4] Pembrolizumab is programmed cell death receptor 1 (PD-1) inhibiting IgG4 monoclonal antibody that prevents PD-1 induced T-cell inactivation by tumor cells.[5] Adverse reactions include skin reactions such as Stevens-Johnson syndrome and bullous pemphigoid, endocrinopathies, hepatotoxicity, nephrotoxicity, and allergic reactions.[4]

Among patients receiving immunotherapy, a rare phenomenon termed hyperprogressive disease (HPD) has been found to occur.[6] First documented in 2016, this poorly understood mechanism manifests as a malignancy paradoxically experiencing accelerated growth after immunotherapy initiation.[7] Numerous case reports and studies explore HPD but fail to address application of this concept in different disease models such as newly arising tumors or cancer phenotype alterations.[8]

We report a case of paradoxical MCC occurring in the setting of pembrolizumab therapy for metastatic SCC.

CASE REPORT

We report an 86-year-old female patient receiving pembrolizumab treatment for metastatic squamous cell carcinoma who presented with a painful, non-bleeding, non-pruritic, raised lesion on her head. The patient initially noticed her lesion two weeks prior to presentation, two weeks into her first immunotherapy session, and reported rapid growth of the mass.

The patient had a past medical history of over fifty squamous cell carcinomas of the skin status post multiple excisions and radiation treatments, essential thrombocythemia, chronic kidney disease, deep vein thrombosis, atrial fibrillation, hypertension, and leukemia. Concomitant medications included amlodipine, metoprolol, triamterene-hydrochlorothiazide, warfarin, anagrelide, ruxolitinib, and pembrolizumab. In addition, she had an extensive history of tanning bed use.

Local examination revealed a firm, non-mobile 3.5 x 3.5 x 2.0 cm erythematous papule with associated heme crusting and secondary impetiginization on the right posterior lateral vertex of the scalp (Figure 1, A). A partial resection of the mass was performed due to high clinical suspicion of Merkel cell carcinoma and was sent for histopathology and with referral to oncology for a PET scan.

Dermatopathology report revealed findings consistent with primary cutaneous neuroendocrine carcinoma, also known as Merkel cell carcinoma, extending to base and edge with lymph vascular and fatty invasion, classified as stage pT2. Microscopic description included sheet-like to trabecular proliferation of relatively uniform, small, round to oval cells with finely dispersed chromatin, numerous mitotic figures, and single-cell necrosis (Figure 2, A and B). The tumor cells had scant cytoplasm that is reactive in a punctate paranuclear pattern positive for cytokeratin, synaptophysin, and chromogranin, but negative for p63 (Figure 2, C and D).

PET scan findings revealed an intensely hypermetabolic exophytic lesion of the right vertex scalp, compatible with MCC, along with bilateral mild to moderately hypermetabolic cervical chain lymph nodes, highly suspicious for regional nodal metastases.

Upon follow-up 5 weeks later, the patient presented with two new, similar but larger lesions around the same area of her scalp, the first measuring 8.0 x 6.0 x 4.0 cm on the right posterior vertex and the second measuring 5.0 x 4.0 x 3.0 cm on the right posterior occipital scalp (Figure 1, B).

Immunotherapy was stopped and radiation therapy was initiated. Upon follow-up three months later, there was significant reduction in size of both tumors (Figure 3).

DISCUSSION

MCC is a cutaneous neuroendocrine tumor of aggressive nature with the highest non-melanoma skin cancer death rate.[9] Although pathogenesis is understood to be multifactorial, 80% of MCC cases are seropositive for Merkel cell polyomavirus (MCPyV), a virus that is believed to behave similarly to the human papilloma virus. MCC typically presents as a pink or violaceous papule, nodule, or plaque with rapid growth that is histologically variable.[10] It is essential to differentiate MCC from small cell carcinoma of the lung via immunohistochemistry, where MCC will reveal positive staining for cytokeratin 20 and negative staining for cytokeratin 7 and thyroid transcription factor 1.[11] MCC has poor prognosis with 5-year survival rates at 51% for localized disease, 35% for nodal involvement, and 14% for metastasis.[10] Factors of poor prognosis include negative MCPyV serology, positive p63 staining, and primary tumor size over 2 cm.[11,12]

The occurrence of MCC in a patient receiving pembrolizumab treatment presents a paradoxical scenario due to the immunotherapy being approved to treat the condition itself. With her advanced age, history of multiple malignancies, and personal history of UV exposure, the patient is already at a high risk for developing MCC. However, whether the cancer was developing prior to onset of immunotherapy and inadvertently but poorly controlled by it, or an HPD was manifesting, is unclear.

The pathophysiology of HPD is explained by either of two leading theories – adaptive immunity to immunotherapy or modified innate immunity. The first describes tumor cells' ability to evade PD-1 inhibition via upregulation of other T-cell inhibition mechanisms. Notably, the upregulation of T-cell immunoglobulin mucin-3 (TIM-3), an alternative immune checkpoint, has been observed in successful adaptive resistance and increased survival of tumor cells. Furthermore, TIM-3 blockade in mice has demonstrated clinical benefit.[13] PD-1 inhibition, beyond its effects on T-cells, alters innate immune system functioning. Major findings reveal that PD-1 blockade can impair the ability for natural killer cells to produce perforins and granzymes, promote interleukin-10 release from type 3 innate lymphoid cells, dendritic cells, and monocytes, and hinder antigen presentation, overall promoting a pro-oncotic

environment.[6,14] These mechanisms may be applicable to our patient's scenario, where pembrolizumab therapy may have induced HPD in a pre-existing MCC or fostered development of a new MCC.

CONCLUSION

This is a case of MCC occurring in the setting of pembrolizumab therapy for metastatic SCC. HPD, a poorly understood phenomenon that occurs in patients receiving immunotherapy has only been documented to occur while being treated for a pre-existing malignancy. The aggressive nature, rapid recurrence, and disease presentation of this patient's MCC allow us to attribute the rare, paradoxical presentation to a potential hyperprogressive disease model applied to a de novo malignancy.

ACKNOWLEDGMENTS/DISCLOSURES

None

ABBREVIATIONS AND ACRONYMS

FDA – Food and drug administration

HPD – Hyperprogressive disease

IgG4 – Immunoglobulin G4

MCC – Merkel cell carcinoma

PD-1 – Programmed cell death receptor-1

PET – Positron emission tomography

SCC – Squamous cell carcinoma

TIM-3 – T-cell immunoglobulin mucin-3

UV – Ultraviolet

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* Osteopathic literature on Merkel cell carcinoma is not available

FIGURE LEGEND

Figure 1 “Merkel cell carcinoma of scalp. A, Solitary lesion at initial presentation. B, Two new lesions on five-week follow-up”

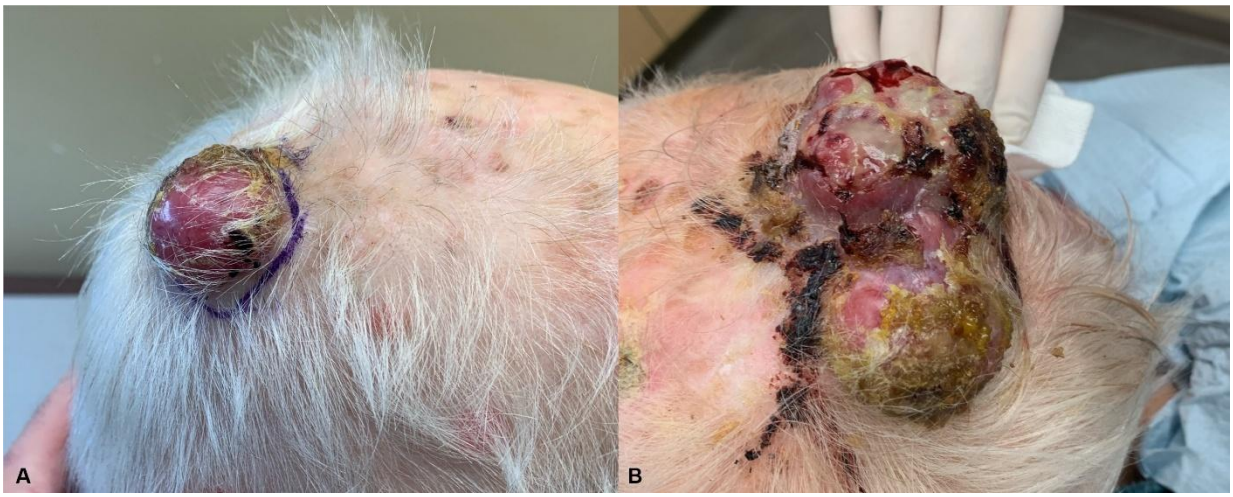


Figure 2 “Histopathology of the Merkel cell carcinoma. A, Sheet-like to trabecular proliferation of relatively uniform, small, round to oval cells (Hematoxylin-eosin stain; original magnification x 10). B, Neoplastic cells will finely dispersed chromatin, numerous mitotic figures, and single-cell necrosis (Hematoxylin-eosin stain; original magnification x 40). C, Punctate paranuclear pattern positive for cytokeratin (Original magnification x 10). D, Immunohistochemistry with synaptophysin (Original magnification x 10).”

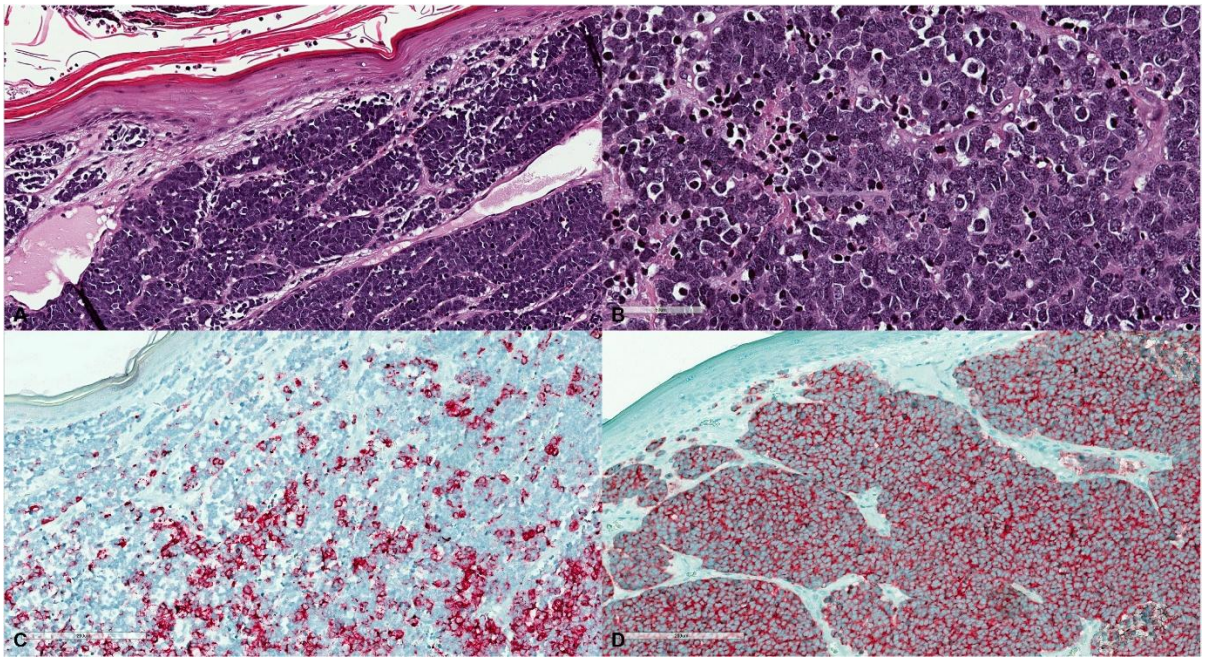
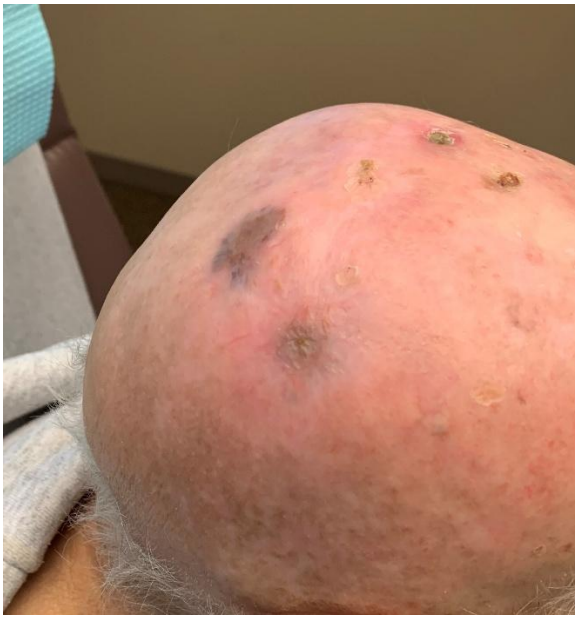


Figure 3 “Three-month follow-up after radiation therapy of Merkel cell carcinoma and discontinuation of pembrolizumab.”



TITLE: Incidental case of Pseudomonas stutzeri pneumonia in a patient with right femur fracture

Authors: Sindy Anton, MS-3; Molly Shipman, DO; Sami Hoshi, MD

Objectives: Pseudomonas stutzeri has rarely been implicated in human illness, and when found, is usually associated with chronic underlying disease or immunocompromised state. We present a unique case of Pseudomonas stutzeri pneumonia in a patient with no predisposing risk factor.

Introduction: Pseudomonas stutzeri is found ubiquitously in various environmental domains.1 Nevertheless, there have been less than 50 reported cases of infection caused by P. stutzeri including pneumonia,2-8 osteomyelitis,9-

13 meningitis,14,15 and endocarditis.16 This infectious agent is regarded as an opportunistic pathogen due to its preponderance in those with immunocompromised state and chronic conditions such as HCV infection,3 COPD,17 cirrhosis,8 and HIV.14,18 Only a handful of cases have been reported without discernible risk factors.2,9

Case Description: 83 yo female with PMHx of osteopenia and chronic cough was admitted for right femur fracture secondary to fall and diagnosed with pneumonia. Patient denied tobacco use but reported chronic propane gas exposure. Physical exam was remarkable for bilateral expiratory wheeze and rhonchi (R>L). Laboratory values revealed leukocytosis of 14.2. CXR and bronchoscopy indicated diffuse interstitial disease in the right upper lobe and left lower lobe. Patient remained afebrile throughout her admission and was treated with a 2-week course of Bactrim. There were no complications that lengthened her admission, and she was discharged home with Bactrim and home oxygen treatment.

Discussion: Differential diagnosis included asthma, hypersensitivity pneumonitis, and bronchitis but her clinical presentation was consistent with bacterial pneumonia. Etiology of pneumonia was investigated for common pathogens via gram staining and bronchoscopy washings, which were inconclusive, and a broad-spectrum regimen was initiated. TB testing via quantiferon was indeterminate and Pseudomonas stutzeri was eventually confirmed via BAL. Susceptibility testing was positive for Bactrim and her broad- spectrum regimen was terminated.

While osteopathic findings weren't documented, we would anticipate somatic inhalation/exhalation rib dysfunctions, TART tissue changes from T1-4 and Chapman points located in 3rd-4th ICS. OMT that could have mitigated her course of pneumonia include rib raising, strain counterstrain of posterior/anterior ribs, and lymphatic drainage.

Conclusion:

- P. stutzeri may demonstrates pathogenicity without predetermined underlying conditions.
- P. stutzeri presents similarly to atypical pneumonia, with characteristics including bilateral lung involvement and afebrile status.

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Piriformis or Not Piriformis? The Impact of OMT on Buttock and Hip Pain: A Case Report

Justin A. Blankenbaker, OMS-IV, Predoctoral OMM Fellow

Eren R. Ural, D.O.

Midwestern University Arizona College of Osteopathic Medicine

Department of Osteopathic Family and Community Medicine

19555 N. 59th Ave., Glendale, AZ 85308

Author Emails for Correspondence:

justin.blankenbaker@midwestern.edu

eural@midwestern.edu

ABSTRACT

Introduction

Piriformis syndrome is an uncommon cause of buttock and hip pain, only comprising up to 6.0% of sciatic-like syndromes. It has several causes, including sitting for prolonged periods and performing repetitive motions, and impairs quality of life by causing physical, mental, and emotional distress. Despite its prevalence, treatment using manual therapies is not well-documented. After ruling out emergent pathology, a strong understanding of anatomy helps distinguish this condition from other musculoskeletal pathologies and guides manual treatment. Osteopathic Manipulative Treatment modalities such as Fascial Distortion Model, Strain-Counterstrain, and Muscle Energy may play an important role in alleviating distress where other methods have failed.

Case Presentation

A 28-year-old female presented with a 1-month course of left buttock and hip pain exacerbated by sitting, standing, and laying down, associated with left leg paresthesia and insomnia. She had several somatic dysfunctions noted on examination, including a Jones tender point, piriformis hypertonicity, herniated triggerpoints, and a triggerband. Anti-inflammatories, alternative medicine modalities, and physical therapy had provided minimal transient relief. Labs and imaging were not indicated at the time of evaluation.

Initial treatment with Muscle Energy and Strain-Counterstrain was unsuccessful in alleviating standing and seated pain, only improving it slightly. With subsequent use of the Fascial Distortion Model after more conventional modalities had failed, seated pain was significantly improved, and standing pain was completely alleviated. Lifestyle modifications were also employed to treat her lower extremity muscle imbalance symptoms.

Using the FACES pain scale and the Pittsburgh Sleep Quality Index as validated tools for measurement, significant improvements were seen in both outcome measures of pain and sleep following treatment.

Conclusion

This report presents a novel case of piriformis syndrome superimposed by fascial distortion through the Osteopathic lens. Osteopathic Manipulative Treatment of piriformis syndrome is not well-documented, and treatment of piriformis syndrome with superimposed fascial distortion has no precedent in existing literature. Identification of the fascial distortions allowed for stepwise treatment progression, a crucial adjustment which allowed for improvement in both outcome measures after conventional modalities had failed. This case highlights the utility of applying Osteopathic principles in assessment, diagnosis, and treatment of piriformis syndrome.

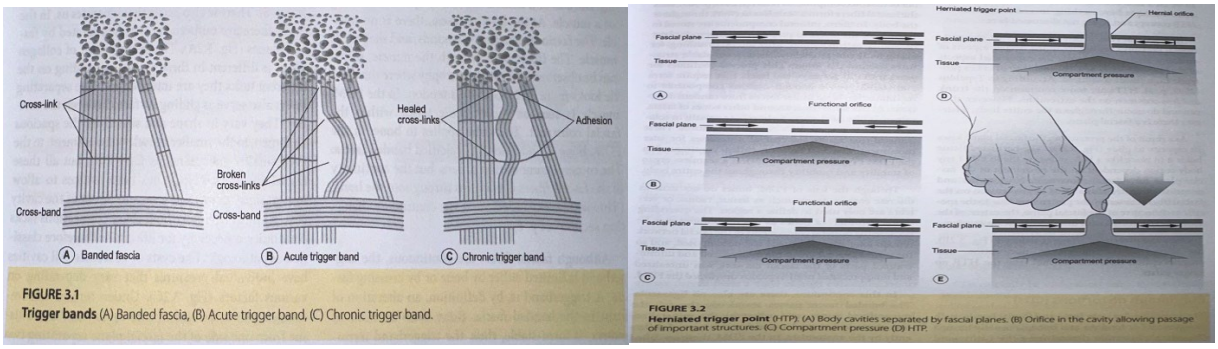
INTRODUCTION

Piriformis syndrome is a clinical condition of sciatic nerve entrapment at the level of the ischial tuberosity, and a relatively uncommon cause of buttock and hip pain, only comprising up to 6.0% of sciatic-like syndromes seen in clinical practice. It has several causes, including sitting for prolonged periods and performing repetitive motions, trauma to the hip/buttock region, piriformis hypertrophy, and anatomic variation of the sciatic nerve in relation to the piriformis.[1] Piriformis syndrome impairs quality of life in those afflicted by causing physical, mental, and emotional distress, often over long periods of time due to its chronicity. Symptoms often include pain to the buttock/hip region with or without radiation down the affected leg, as well as paresthesia to the affected region with or without radiation down the affected leg. It can also cause weakness of the affected leg, a mimic concerning of more serious radicular pathology.

The Fascial Distortion Model (FDM) is a diagnostic and treatment model based on an anatomical perspective in which disease and injury are thought to be comprised of one or more of six specific distortions in the fascia, all of which compromise its structural tensegrity.[2]

Banded fascia is a type of fascia that can be found wherever longitudinal forces are present in the body. A triggerband (TB) is a dysfunction of banded fascia and occurs due to non-parallel shearing forces against the parallel arrangement of these fibers, causing twists in the fascia (Image 1).[3]

Another type of fascia is separating fascia, which forms anatomical cavities that contain orifices allowing for neurovasculature to pass through said orifices. A herniated triggerpoint (HTP) occurs when tissue within a cavity passes through this inherently weak orifice, compressing the neurovasculature bundle and causing symptoms (Image 2).[3]



Images 1-2: Depiction of TB and HTP Pathology[3]

Despite the prevalence of piriformis syndrome, treatment using manual therapies is not well-documented. A thorough review of the available existing literature yielded no case reports or studies showing treatment of piriformis syndrome with OMT modalities such as Muscle Energy (ME) and Strain-Counterstrain (SCS). Additionally, treatment of piriformis syndrome with superimposed fascial distortion warranting use of the FDM has no precedent in existing literature.

Given the progression of symptoms can result in sciatic nerve entrapment with permanent nerve damage, prompt evaluation of any radicular-like symptoms is crucial to rule out pathology such as disc herniation or cauda equina syndrome. However, after ruling out emergent pathology, a strong understanding of anatomy helps distinguish this condition from other musculoskeletal

pathologies and can effectively guide manual treatment for the knowledgeable practitioner. Osteopathic Manipulative Treatment modalities such as FDM, ME, and SCS may play an important role in alleviating distress seen in piriformis syndrome where other methods have previously failed.

CASE PRESENTATION

K. K. is a 28-year-old full-time female student who presented with left buttock and hip pain of 1 month duration. She had suffered a recent right back injury which caused debilitating pain, particularly with sitting while studying. The day of that initial injury she presented to urgent care, and treatment for the acute right back injury consisted of several intramuscular and oral medications, a physical therapy (PT) referral, and instructions to exclusively stand while studying due to pain while sitting.

One month later, the initial right back strain had nearly resolved. However, while recovering she suffered a new-onset, worsening left buttock and hip pain rated 10/10 in severity with standing, sitting, and laying down, prompting her to present to us. She was concerned it was related to the recommendation to exclusively stand while studying, which she had adopted following the recommendation of the urgent care physician.

Her pain was described as “sharp in the center with a glowing burning ember around it,” and it worsened to the point that she also developed paresthesia down the left leg and new-onset insomnia. Flares occurred within 5 minutes of sitting and took an hour to dissipate once she started standing. She found no relief when standing in a mid-gait cycle stance, alternating which leg is forward every few minutes, and additionally found no relief with 8 weeks of PT, ice, dry needling, and several additional medication regimens.

Her past medical history is notable for hypothyroidism, for which she takes levothyroxine. Surgical and family history are noncontributory. Social history is notable for imbibing 1-2 drinks per week socially and frequent exercise consisting of pickleball several times per week and skydiving several times per month. She also uses an oral contraceptive pill daily and has no known drug allergies.

Review of systems was notable for pain of the left buttock and hip region, paresthesia of the left lower extremity, insomnia, and difficulty concentrating. Red flag symptoms such as saddle anesthesia and incontinence of bowel and/or bladder were absent. All other systems were grossly negative.

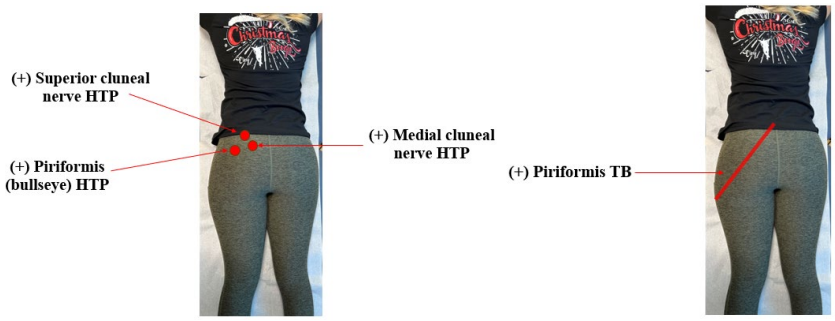
On initial physical exam, her vitals were stable with BP 127/87 mmHg, heart rate 77 bpm, respiratory rate 14 rpm, height 5’7’’, weight 160 lbs., and BMI 25.1 kg/m^2. She appeared uncomfortable while sitting and appeared tired. She had normal strength, sensation, and reflexes to both lower extremities, and no rashes or lesions over the affected left hip or buttock region.

Initial Osteopathic examination included orthopedic special testing, which demonstrated a bilaterally positive Trendelenburg test (Image 3), as well as bilaterally negative hip drop test and straight leg raise test. Additionally, she was found to have bilaterally hypertonic lumbar

paraspinal musculature, as well as left piriformis hypertonicity with a corresponding Jones tender point.

Image 3: Bilaterally Positive Trendelenburg Test

Osteopathic examination at her second visit included FDM screening, which revealed HTPs to the left piriformis (bullseye), superior cluneal nerve, and medial cluneal nerve (Image 4). Additionally, she had a TB of the left piriformis (Image 5).



Images 4-5: Locations of Left Piriformis (Bullseye), Superior, and Medial Cluneal Nerve HTPs, and Left Piriformis TB

After a thorough physical examination and history, it was concluded that labs and imaging were not warranted at the time of initial evaluation, as the information gathered indicated a serious pathology was extremely unlikely.

The initial differential diagnosis for K. K. included piriformis syndrome and lower extremity muscle imbalance, with less likely diagnoses of lumbar radiculopathy, lumbar foraminal stenosis, lumbar spondylolisthesis, and cauda equina syndrome considered but eventually ruled out by history and examination.

The final assessment included piriformis syndrome, insomnia, and hypothyroidism, as well as Osteopathic diagnoses of lower extremity muscle imbalance and somatic dysfunction of the pelvis and lower extremity. Based on the history and physical exam taken it was determined that the patient was a candidate for OMT, which was the primary aspect of the treatment plan.

DISCUSSION

Treatment Sequence and Patient Response to Treatment

Visit 1 OMT included SCS and ME of the left piriformis, to address the findings of piriformis hypertonicity and the Jones tender point that were found on examination (Images 6-8). However, this targeted treatment only improved baseline standing and seated pain from a 10/10 to a 9/10, respectively (Figure 1).

Images 6-8: Depiction of SCS of the Left Piriformis Jones Tender Point and ME of the Hypertonic Left Piriformis

Due to the unexpected lack of improvement in symptoms after the first treatment, the concept of fascial distortion superimposed on classic piriformis syndrome was then seriously considered, which may have been preventing the original SCS and ME treatments from being fully effective. FDM reduction of her HTPs and TB was performed while prone (Images 9-12) with resulting complete alleviation of standing pain from a 9/10 to a 0/10 and marked improvement of seated pain from a 9/10 to a 5/10 (Figure 1).

Images 9-12: Depiction of FDM Reduction of Left Superior Cluneal Nerve. Left Medial Cluneal Nerve, and Left Piriformis (Bullseye) HTPs, and Left Piriformis TB (Prone)

At visit 3, the patient noted standing pain had remained completely alleviated, though she still had symptoms with sitting. At this point, she was instructed to sit to reproduce her pain, at which point the HTPs were retreated in that seated position (Images 13-15); the TB had not recurred and did not require additional treatment. Following this treatment, standing pain

remained completely alleviated, and seated pain further decreased from a 5/10 to a 3/10 immediately (Figure 1).

Images 13-15: Depiction of FDM Reduction of Left Superior Cluneal Nerve, Left Medial Cluneal Nerve, and Left Piriformis (Bullseye) HTPs (Seated)

Additionally, the patient was asked to complete a Pittsburgh Sleep Quality Index (PSQI) questionnaire at baseline prior to treatment, as well as after the third treatment.[4] Not only did K. K. report subjective improvement in sleep quality after 3 treatments, but objectively, improvements were seen in scores for total dysfunction (global PSQI score), sleep quality, sleep latency, sleep efficiency, and sleep medication use (Figure 2).

Given the success of OMT after three visits, the patient was then provided with instructions for complimentary treatment interventions. In accordance with Greenman's description of lower extremity muscle imbalance, she was first provided with exercise prescription for home exercises to stretch her hypertonic muscles (piriformis, hip flexors, hip adductors) to be performed 1-2x daily, and strengthen inhibited/weak muscles (abdominals, gluteus maximus, gluteus medius) to be performed 2-3x weekly.[5] Additionally, she was instructed to continue PT, take short breaks throughout day to walk and stretch, continue use of a pillow between her legs at night if needed, and to return to clinic for additional OMT in 1 week if needed.

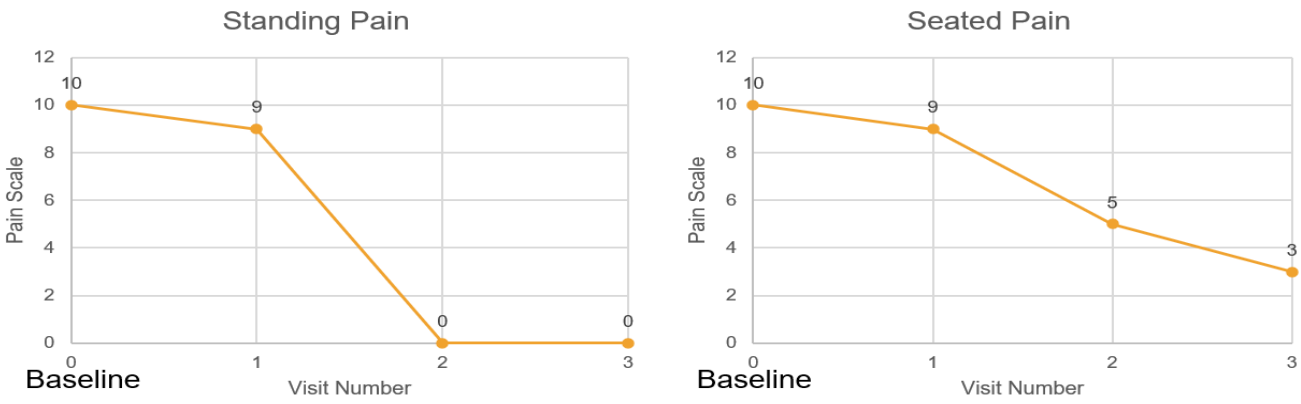


Figure 1: Comparison Graphs of Standing Pain and Seated Pain Variation Following Treatment, By Visit Number

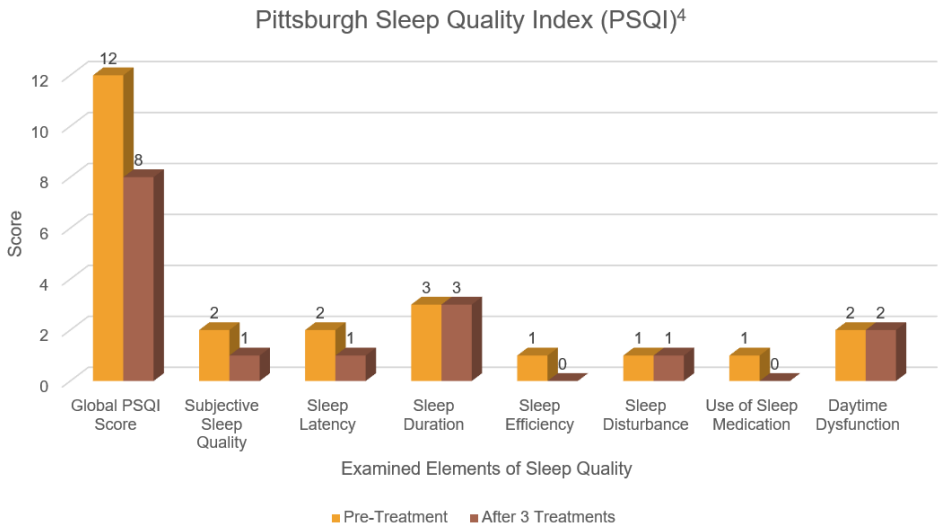


Figure 2: Graph Depicting Results of the PSQI Evaluation Categories, Pre-Treatment and After Three Treatments

Conclusions and Further Study

Piriformis syndrome can cause debilitating pain that leads to physical, mental, and emotional distress as seen in the case of K. K. Her intractable pain led to a notable decrease in sleep quality as seen on the PSQI, impacting her quality of life significantly. Given the literature gap pertaining to use of manual therapies in treatment of piriformis syndrome, her case provides crucial evidence of the utility of OMT in the treatment of this clinical condition, especially when traditional methods of treatment such as anti-inflammatories, rest, and ice have been ineffective.

However, the case of K. K. was not as simple as it initially seemed. The fascial distortions present overlaid a presentation of piriformis syndrome that otherwise appeared deceptively classic in nature, thereby preventing more conventional OMT modalities such as SCS and ME from being fully effective. This stands in stark juxtaposition to what would be expected, as it stands to reason that most patients would likely see significant improvement with these modalities given their overall validation in the body of Osteopathic literature available. Yet, only after subsequent treatments with FDM techniques was meaningful improvement seen in the case of K. K. Treatment of this novel presentation of piriformis syndrome with OMT in an adaptive, stepwise fashion resulted in significant improvements in the primary and secondary outcomes of pain and sleep quality, respectively.

The case of K. K. highlights the clear utility of OMT as a treatment method for piriformis syndrome, though the current lack of corroborating literature for its use in addressing this clinical condition is evident. Future case reports and/or clinical research studies evaluating the use of OMT in treating piriformis syndrome are necessary to support the conclusions drawn in this case report and provide a promising avenue for further demonstration of the impact of OMT in the clinical setting.

ACKNOWLEDGEMENTS/DISCLOSURES

Demonstration photos of patient and treatment kindly taken by Dr. Jenna Sangkam, D.O., and used with permission from patient K. K. Taken on 12/7/23 at 1:00pm.

Tremendous gratitude is extended to: My patient, K. K.; Dr. Eren Ural, D.O.; Dr. Katie Neuer, D.O.; Dr. John Ashurst, D.O.; Dr. Jenna Sangkam, D.O.; The AZCOM OMM Scholars.

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Abstract

Title: Delayed Diagnosis of Rare Hepatic Endometriosis Due to Endometriosis-Related Stigma: A Case Report

Authors and Affiliations:
Samantha Boever, OMS II
Denise Sackett, D.O., Clinical Associate Professor

Objectives: The objective is to highlight a clinical case involving a young female patient diagnosed with hepatic endometriosis, an exceedingly rare manifestation of the condition that has limited documentation in the literature. We will discuss the events preceding her diagnosis, exhibiting how endometriosis-related stigma contributed to a delay in reporting symptoms and hesitancy in seeking formal evaluation.

Introduction/Background: Endometriosis, marked by the presence of endometrial-like tissue outside the uterus, predominantly affects premenopausal women. While clinically recognized as a benign condition, symptomatic cases lead to persistent pelvic pain, diminished quality of life, and increased morbidity. While extrauterine endometrial implants are commonly located within the pelvis, there are rare occurrences where these implants can deposit in locations outside of the pelvis, such as in the liver (hepatic endometriosis).

Case Description: Our case involves a 27-year-old nulliparous woman with a two-year history of recurrent, severe lower abdominal pain associated with menstruation. Despite discontinuing contraceptives, she has been unable to conceive. A recent episode of sharp, right-sided abdominal pain prompted her to consider seeking emergency care. However, for fear of being labeled as an “excessive complainer”, she decided instead to be evaluated at a walk-in clinic the following day. Ultrasound findings raised suspicion of multiple endometriomas/hemorrhagic cysts. Diagnostic laparoscopy revealed extensive endometrial deposits, bilateral endometriomas, and numerous adhesions, confirming a diagnosis of endometriosis without the need for additional biopsy.

Discussion: The cause of endometriosis is unclear, with proposed factors like retrograde menstruation, coelomic metaplasia, and hematogenous/lymphatic dissemination. Retrograde menstruation suggests spread within the pelvis, but distant lesions may be better explained by hematogenous or lymphatic dissemination. Further research is needed to understand this complex disease, and timely medical care is crucial to prevent worsening disease severity.

Conclusions/Outcomes: At diagnosis, the patient's endometriosis had progressed to stage four, heightening infertility risk. With hepatic involvement, laparoscopic surgery may not entirely alleviate chronic pelvic pain. In our case, stigma led to a two-year delay before seeking medical evaluation. Therefore, it is incumbent to raise awareness about the severity of the pain associated with this condition and emphasize the importance of promptly diagnosing and treating patients with endometriosis.

Title

A Case Report of Spontaneous Superficial Temporal Artery Hemorrhage Following COVID-19 Infection

Authors and Affiliations

Shivam Chandra, OMS2
A.T. Still School of Osteopathic Medicine in Arizona

Kelly M. Frasier, DO, MS
Wyckoff Heights Medical Center

Sarah Rahni, OMS4
Touro College of Osteopathic Medicine, Midtown Campus

Umair Ahmad, MD
Wyckoff Heights Medical Center

Objectives

The primary objective of this case report is to highlight potential long-term vascular complications associated with COVID-19, as demonstrated by a spontaneous superficial temporal artery hemorrhage leading to a large scalp hematoma. This case is particularly noteworthy due to the absence of prior hemorrhages or predisposing factors for vessel rupture in the patient's medical history, suggesting a possible direct link to post-COVID syndrome. The report of this case contributes valuable insights into the evolving understanding of COVID-19's impact on vascular health, especially in patients with no previous history of vascular issues.

Introduction/Background

Recent studies have increasingly linked Post-COVID syndrome and COVID-19 to significant autonomic changes and the onset of endothelial dysfunction. There have been reports of vasculitis-like episodes in individuals who had no prior signs of endothelial dysfunction or autoimmune conditions, supporting the hypothesis that COVID-19 and post-COVID syndrome might trigger vascular dysfunction episodes.

Case Description

The case involves a patient with a large right scalp hematoma from a spontaneous superficial temporal artery hemorrhage, occurring three months post-COVID-19 recovery. The patient had right temporal lobe swelling, measuring 9cm x 6.5cm, with normal extraocular and cerebellar functions. Symptoms included uncontrolled hypertension, tachycardia, and generalized weakness, with initial systolic blood pressure between 146-174 mmHg. Treatment involved IV labetalol and morphine. The lack of prior hemorrhagic incidents underscores the potential post-COVID vascular implications.

Discussion

Differential diagnoses for this case included spontaneous hemothorax, subdural hematoma, intracerebral hemorrhage, spontaneous muscle hematoma, and other vascular incidents. This case underscores the potential for long-term vascular complications following COVID-19 infection. The patient experienced chronic fluctuations in blood pressure and heart rate, leading to a severe superficial scalp hematoma over the right frontotemporal region, with ongoing bleeding from the right superficial temporal artery. These observations contribute to the accumulating evidence on COVID-19's potential vascular impacts, particularly in cases with hypertension and tachycardia. Due to active hemorrhage, osteopathic manipulative medicine was contraindicated.

Outcomes

The patient's hemorrhage was controlled with a pressure bandage, avoiding neurosurgical embolization. This demonstrates effective conservative management in cases without prior vessel rupture indicators and underscores the need for post-COVID vascular monitoring.

Four Days of the Keto Diet and SGLT2 Inhibitors: A Recipe for Diabetic Ketoacidosis

Jazmine David, OMS-III, 19555 N 59th Ave, Glendale, AZ 85308
jazmine.david@midwestern.edu

Kirby Farnsworth, DO, 7727 W Deer Valley Rd #215, Peoria, AZ 85382
kirby@simplydirecthealth.com

Charles Finch, DO, FACOEP, 19555 N 59th Ave, Glendale, AZ 85308
cfinch@midwestern.edu

Abstract
Sodium-glucose cotransporter protein 2 inhibitors are a commonly prescribed class of antidiabetic drugs well-known for its cardiorenal-protective benefits. There is increasing evidence behind the association between sodium-glucose cotransporter protein 2 inhibitors, low-carbohydrate diets, and diabetic ketoacidosis, which is a rare, but life-threatening complication. In this case report, we present a patient with diabetic ketoacidosis on a ketogenic diet while taking empagliflozin, a sodium-glucose cotransporter protein 2 inhibitor. A 67-year-old male with a history of coronary artery disease and poorly-controlled type 2 diabetes on metformin and empagliflozin presented to the emergency department with a two day history of severe nausea, multiple episodes of emesis, progressive myalgias, low back pain, and dizziness. He had started a low to no-carbohydrate diet four days prior to presentation. He was found to have an anion gap of 28, carbon dioxide of less than 5 mmol/L, glucose of 257 mg/dL, creatinine of 1.84 mg/dL, pH of 7, pCO2 of 16.1 mmHg, and bicarbonate of 4 mmol/L, Urinalysis revealed 4+ glucose, and 4+ ketones. The patient was diagnosed with diabetic ketoacidosis and treated with intravenous fluids, insulin drip, and bicarbonate drip in the intensive care unit until the anion gap closed. Prior to prescribing sodium-glucose cotransporter protein 2 inhibitors, physicians should provide education regarding the increased risk of diabetic ketoacidosis especially when combined with low-carbohydrate diets.

Introduction

Diabetic ketoacidosis (DKA) is a life-threatening complication of diabetes mellitus characterized by hyperglycemia, metabolic acidosis, and increased generation of ketones.[1] DKA is primarily found in type 1 diabetes and rarely found in type 2 diabetes (T2DM).[2] Common triggers for DKA include new onset of diabetes, acute stressors such as injuries and infections, and medication non-compliance.[1] DKA is typically defined as blood glucose greater than 250 mg/dL, arterial pH less than 7.3, serum bicarbonate less than 15 mEq/L, and ketonemia or ketonuria.[1] Common clinical features include polydipsia, polyphagia, polyuria, decreased urine output, nausea, vomiting, tachycardia, and tachypnea, specifically labored, large tidal volume breaths also called Kussmaul breathing.[1] If treated promptly, individuals with DKA can fully recover, but older individuals with significant comorbidities have a higher mortality rate.[1]

Sodium-glucose cotransport protein 2 (SGLT2) inhibitors are commonly used diabetes medications that improve blood sugar control in T2DM by promoting urinary glucose excretion.[3] SGLT2 inhibitors have also demonstrated renal and cardioprotective effects.[3] SGLT2 inhibitors can promote DKA, especially when combined with insulin.[4] Although DKA is typically defined by having a blood glucose greater than 250 mg/dL, SGLT2 inhibitors can predispose individuals to euglycemic DKA with a blood glucose less than 250 mg/dL.[5] This case characterizes a patient with T2DM on SGLT2 inhibitors who developed DKA after four days of the ketogenic diet.

Case Report

A 67-year-old male with a past medical history of T2DM, coronary artery disease, and chronic left-sided nephrolithiasis reported to the emergency department with a chief complaint of vomiting for two days. He complained of progressive nausea, dyspnea, diffuse myalgias, back pain, dizziness, malaise, and headache. He denies dysuria, hematuria, chest pain, rash, and jaundice. He admits to starting a ketogenic diet four days prior to presenting to the emergency department. He had a previously diagnosed 13 mm calcium oxalate stone in his left kidney that was to be addressed by his nephrologist. Ten years prior, he had undergone placement of two coronary artery bypass grafts and three coronary stents. His medications were metoprolol succinate, testosterone, empagliflozin, metformin, and clopidogrel. He reported allergies to fluoroquinolones, Percocet, and statins. He denied current tobacco, alcohol, or illicit drug use.

Initial emergency department vitals indicated a blood pressure of 153/82, heart rate of 111, respiratory rate of 22, an oxygen saturation of 99 percent on room air, and a BMI of 30.4. Physical exam revealed an alert, oriented male in moderate distress. Cardiac auscultation revealed tachycardia, regular rhythm, normal S1 and S2, and no murmurs, rubs, or gallops. Respiratory exam showed clear breath sounds bilaterally, moderate respiratory distress with tachypnea and large tidal volumes, accessory muscle use, equal chest excursion, and ability to speak short phrases. The abdominal exam demonstrated a non-tender, mildly distended abdomen with hypoactive bowel sounds in all four quadrants with no rebound tenderness or guarding. Skin was warm, dry, with normal turgor and no rashes or lesions. Osteopathic exam revealed boggy tissue changes in the paraspinal musculature from T10 to L1 on the left.

Electrocardiogram revealed sinus tachycardia, right atrial enlargement, and no ST segment elevations. Chest x-ray showed no acute cardiopulmonary disease. CT abdomen and pelvis showed no acute process, non-obstructive left-sided nephrolithiasis, and simple renal cysts. Complete blood count demonstrated leukocytosis of **22.7 k/UL** with neutrophil predominance and an elevated hemoglobin of **17.8 g/dL**. Complete metabolic panel demonstrated sodium of **136 mmol/L**, potassium of **5.2 mmol/L**, carbon dioxide of **less than 5 mmol/L**, **28** anion gap, glucose of **257 mg/dL**, eGFR of **40**, blood urea nitrogen of **22 mg/dL**, and creatinine of **1.84 mg/dL**. Lipase was 208 U/L, lactate was 2.6 mmol/L, troponins were less than 0.012 ng/mL, and TSH was 3.250 uIU/mL. Arterial blood gas revealed pH of **7**, pCO2 of **16.1 mmHg**, HCO3 of **4 mmol/L**, and PO2 of **74 mmHg**. Urinalysis revealed pH 5.5, specific gravity of 1.023, **4+** glucose, **4+** ketones, **2+** protein, **2+** blood, and negative nitrites and leukocytes. He tested negative for COVID-19 and influenza.

The patient was diagnosed with diabetic ketoacidosis and acute kidney injury likely secondary to dehydration. He received several liters of intravenous fluid, insulin drip, bicarbonate drip, IV zosyn and vancomycin, and was transferred to an ICU at a different facility. There, he continued to receive intravenous fluids, insulin drip, and bicarbonate drip. His anion gap closed and he was discharged with instructions to follow-up with his primary care provider and nephrologist.

Discussion

This case illustrates a case of profound DKA in a patient following a ketogenic diet on an SGLT2 inhibitor. Prior studies have shown that there is an estimated 0.34% prevalence rate of DKA in individuals taking empagliflozin, 0.43% in individuals taking dapagliflozin, and 0.21% in individuals taking canagliflozin.[4] The most common triggers were found to be infection at 32.6% and insulin non-compliance at 13.7%.[4] Surgery, dehydration, low-carbohydrate diets, and pancreatitis are other known triggering factors.[6]

Although a low-carbohydrate diet has been associated with improved glycemic control and weight loss in T2DM,[7] it is important to consider the risks of implementing this diet for diabetic patients on SGLT2 inhibitors. Review of the literature revealed that there have been prior reports of DKA in a patient on an SGLT2 inhibitor after starting the ketogenic diet.[8-11] The proposed mechanism by which SGLT2 inhibitors cause DKA is glucosuria by decreasing serum glucose and renal sodium reabsorption, decreasing insulin release and ketone body excretion.[12] SGLT2 inhibitors promote glucagon excretion by stimulating pancreatic alpha cells, increasing lipolysis, fatty acid oxidation, and ketone production.[12]

The osteopathic findings from the case align with a case-control study of patients with T2DM and osteopathic structural findings. The study suggests there is a significant association between T2DM and tissue changes from T11 to L2 on the right and T2DM and hypertension with bilateral tissue changes from T11 to L2.[13] Additionally, the patient's chronic left-sided nephrolithiasis may also play a contributing factor to the osteopathic findings. Various osteopathic treatment modalities have been suggested as adjunct to traditional diabetes treatment, including rib raising of the second to fifth ribs to decrease glucose levels,[14] which may be of benefit in the outpatient treatment of T2DM.

This case represents a part of the growing evidence behind the association of low-carbohydrate diets and SGLT2 inhibitors with the development of DKA. Prior to prescribing this class of medications, it is essential for physicians to determine whether the patient is currently on low-carbohydrate diet and to encourage patients to communicate when considering dietary changes. Additionally, it is critical to provide education regarding the signs and symptoms of DKA and the increased risks of DKA associated with SGLT2 inhibitors.

Acknowledgments/Disclosures

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Case Study: Atypical Presentation of a Widespread Aortic Dissection in a Young Healthy Female

Desiree Delavary OMS3 A.T. Still SOMA
Emmanuel Khodra OMS3 NYIT
Jaskaran Ghotra OMS3 NYIT
Bhakti Patel OMS3 NYIT
Peter Nguyen OMS3 A.T. Still SOMA
Dr. Michael Poulose Physician, St. Joseph Hospital Long Island, NY

Objective:

This case demonstrates a seizure as the initial presentation for an aortic dissection. As an aortic dissection is a life threatening condition that requires time-sensitive treatment, bringing awareness to atypical presentations can help encourage efficient and adequate management.

Intro/ Background

Aortic dissection, caused by a tear in the intimal layer of the aortic wall, has a reported occurrence of 5-30 cases per 1 million people annually (Levy, 2023). It classically presents as a sudden, tearing chest pain that may radiate to the back. The chest X-ray may show a widened mediastinum. Symptomatology depends on the aortic branch affected.

Case Description

Patient M is a 43 year old female that presented to the Emergency Department due to "seizure-like" activity. In the ED, the patient had another 30 second episode of seizure-like activity with emesis. Patient was given 2mg of Ativan and 1g of Keppra. Prompt CT brain and EKG findings were unremarkable. Chest X-Ray demonstrated perihilar edema and/or infection. CBC/CMP showed mild hypokalemia, and hyperglycemia (306).

The patient was found to be hypotensive and bradycardic (HR 50) overnight, with a BP discrepancy between her upper extremities. Following this, a CT Abdomen, Chest and Pelvis, and CTA head and neck were completed, revealing an extensive type A aortic dissection. This dissection involved the left common carotid artery, the left internal carotid artery, and the right common carotid artery, extending into the proximal right internal carotid artery. Hyperdensity of the Left MCA suggested a thrombus. The patient was transferred to neurosurgery.

Discussion:

Differential diagnosis of the patient's presentation included new onset seizure, convulsive syncope, drug overdose, stroke, and alcohol withdrawal. Considerations of possible etiologies prompted head CT, EKG and chest X-Ray, which were all initially negative. Hypotension and

bradycardia overnight with asymmetric BP measurements broadened the differential to vascular causes.

Conclusion

This case demonstrated a potential seizure as the initial presentation for an aortic dissection. Potentially caused by neuro-vascular alterations, this case elucidates how an aortic dissection may be considered in the differential for presentations of new-onset seizure.

Title: Well's Syndrome: A Rare Case of Eosinophilic Cellulitis

Authors:
Omar Guerrero OMS III[1], Eve Ashby DO[1]

1. A.T Still School of Osteopathic Medicine in Arizona

Objective:

- Well's syndrome (WS) is a rare inflammatory skin condition often misdiagnosed as bacterial cellulitis.
- Mepolizumab, an anti-IL-5 antibody, has demonstrated effectiveness in the treatment of WS.

Introduction/Background:
WS, also known as Eosinophilic Cellulitis (EC), was first identified by G.C. Wells in 1971. It presents as pruritic, red plaques resembling infectious cellulitis, histologically characterized by edema, eosinophil infiltration, and the presence of "flame figures." Despite approximately 200 documented cases, the pathogenesis of WS remains unclear, with a potential association with type IV hypersensitivity.

Case Description:
This case report involves a woman in her twenties who developed blistering lesions on her lower extremity without a clear trigger. Initially treated as cellulitis, the lesions failed to respond to antibiotics, but showed positive responses to immune modulators, including steroids and dupilumab—an anti-IL4 & 5 antibody, used to treat atopic dermatitis. Although initially effective, this treatment led to erythema nodosa. Despite a comprehensive clinical workup, no definitive answers were found, except for the presence of eosinophilia. Multiple biopsies during flare-ups consistently indicated an allergic/eosinophilic process. A conclusive diagnosis of WS was eventually established, providing the patient with a potential treatment direction. Following treatment with mepolizumab, an anti-IL5 antibody, the patient has remained free from flare-ups.

Discussion:
The etiology of WS remains elusive, and various stimuli, including viral, fungal, bacterial, and parasitic infections, insect bites, vaccines, drugs, and malignancy, have been proposed through case reports. Consideration of WS is crucial for individuals with a recurrent history of non-tender, pruritic, cellulitic plaques that fail to respond to antibiotic treatment. A distinctive histopathological examination, featuring an eosinophilic dermal infiltrate, "flame figures," and peripheral eosinophilia, supports the clinical diagnosis. However, due to the lack of specificity in clinical, histological, and laboratory aspects of WS, a comprehensive correlation of clinical and pathological information is essential for a definitive diagnosis.

Conclusion/Outcomes:
This case underscores the diagnostic and therapeutic challenges associated with WS. The heterogeneous nature of its presentation, coupled with the absence of a well-defined etiology and treatment guidelines, necessitates a multidisciplinary and individualized approach. Although no standard treatment approach has been established for WS, considering mepolizumab in patients with similar presentations should be contemplated.

Long-Awaited Relief After Osteopathic Manipulative Treatment in Postconcussion Syndrome: A Case Report

Dylan Hampel, OMS-IV, John Ashurst DO, DEd, MS, Christina Martin, DO

Midwestern University Arizona College of Osteopathic Medicine

19555 N 59th Ave. Glendale, AZ, 85308

Dylan Hampel: dhampel67@midwestern.edu

John Ashurst: jashur@midwestern.edu

Christina Martin: cmarti2@midwestern.edu

ABSTRACT

Introduction

Postconcussion syndrome occurs when new-onset, somatic, cognitive, and emotional symptoms persist for three months post-mild traumatic brain injury. A 2022 randomized clinical trial demonstrated that Osteopathic manipulative treatment improves postconcussion neurocognitive impairments in healthy college athletes.

Case Presentation

A 55-year-old female presented with a chief complaint of migraine after suffering a mild traumatic brain injury due to a pedestrian versus motor vehicle accident.

She experienced new-onset cognitive, emotional, and somatic symptoms with vestibulo-ocular disturbances. She found little to no relief with medications, and physical therapy.

Osteopathic exam findings were significant for dysfunctions of the cranial, cervical, upper extremity, and sacral regions. A final diagnosis of postconcussion syndrome best encompassed her neurocognitive profile. The patient received Osteopathic manipulative treatment five times weekly to the affected regions, a daily exercise prescription targeting the suboccipital and cervical musculature, and a tapering protocol for vortioxetine.

Following treatment, a 15-point decrease in her total Postconcussion Symptom Scale score was noted and the patient no longer needed medications for mood.

Conclusion

Osteopathic manipulative therapy should be seen as a treatment option for those suffering from postconcussion syndrome.

CLINICAL CASE

Introduction

In Arizona alone, over 66,000 traumatic brain injuries (TBIs) occur each year, with associated hospital, rehabilitation, and incarceration costs consuming nearly one-quarter of the state's Medicaid budget.[1] While many TBIs inflict immediate and lasting neurologic deficits, individuals who experience the subcategory of mild TBIs (mTBIs) may experience lasting impacts to their quality of life when they develop postconcussion syndrome (PCS).[2] PCS occurs when new-onset, somatic, cognitive, and emotional symptoms persist for three months post-mTBI.[3] Up to 25% of mTBIs result in PCS, demonstrating the need for effective treatment strategies in varied populations who fail first-line treatments.[4]

The literature search revealed a 2022 randomized clinical trial demonstrating that OMT improves postconcussion neurocognitive impairments. The investigators divided subjects with concussions into either a control group that received education about recovery from concussion or an intervention group that received two 30-minute OMT treatments. Investigators reported significantly improved recovery of visual memory and reaction time in the OMT intervention group based on Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) measurements. The OMT protocol in the treatment focused on the cranium and thoracic outlet to promote glymphatic and venous drainage from injured tissue.[5]

However, the study only included healthy college athletes, excluding older patients with PCS who may have prevalent comorbidities and frequently face clinical accusations of malingering, exaggeration, and lack of recovery effort.[6] This literature and patient experience gap presents an opportunity physicians can address with evidence-based OMT in an understudied population. This case reports successful improvement of PCS symptoms after OMT in a patient from an understudied demographic who failed first line treatment.

Case Presentation

A 55-year-old female presented to the family medicine clinic with a chief complaint of migraine. Several months before arrival, she suffered a mTBI when a distracted driver backed out of a parking space and pinned her cranium between two vehicles. She did not lose consciousness but was acutely disoriented. She waited three weeks to seek care at a concussion treatment center where neuroimaging ruled out intracranial pathology and cervical instability.

Post-injury, her migraine frequency increased from 1 to 4 times per week, and pain increased from 3 to 8/10. Vestibular and physical therapy provided minimal relief, and an occipital nerve block provided marked relief but lasted 12 hours. Combined PCS symptoms also prevented her from enjoying her fulfilling career.

Her past medical history was notable for depression, anxiety, and type 2 diabetes (T2DM). Since the injury, her migraine and depression care escalated to include sumatriptan 100 mg and vortioxetine (Trintellix) 20 mg, respectively. She also takes bupropion 300 mg for depression, galcanezumab (Emgality) 120mg/mL for migraine prevention, and metformin 500mg for T2DM. Her review of symptoms revealed worsened migraine quality and quantity, photophobia, hyperacusis, nausea, difficulty concentrating, brain fog, emotional lability, anxiety, insomnia, neck pain, upper back pain, and dizziness with nausea after eye movement.

Upon physical exam, her vital signs were all within normal limits. She had diminished attentiveness and limited range of motion in the cervical spine during active and passive flexion and right sidebending. She had no bruising, gross deformity, or abrasion to the head. She had no acute neurologic deficits but felt dizzy while testing extraocular movements. Her reports of symptoms with eye movement prompted tests of saccades, smooth pursuits, and the vestibulo-ocular reflex. Saccades were intact but caused immediate dizziness and nausea. Smooth pursuits were intact but sluggish. Her vestibulo-ocular reflex caused dizziness and postural sway, and her Romberg test was negative.

Her Osteopathic exam findings in the cranial field were a left torsion, venous sinus congestion, frontonasal and maxillo-lacrimal suture restriction, and bilateral orbital myofascial restriction. Her other notable findings were a thoracic inlet myofascial restriction, left levator scapulae spasm, bilateral spasm of the suboccipital musculature, left superior clavicular head, and lumbosacral compression.

After discussing the risks and benefits of relevant treatment options, the patient agreed to a plan using OMT to address PCS symptoms. The patient received five 25-minute OMT sessions separated by at least one week in a quiet, dimly-lit exam room. In addition to OMT, she also received a daily therapeutic exercise prescription targeting cervical musculature, and she was advised of a tapering protocol for her vortioxetine.

Before treatment at each visit, the patient completed a Postconcussion Symptom Scale (PCSS), ultimately establishing a 15-point decrease in total score by her last visit (Figure 1). Among PCSS domains, her most distressing problems of visual disturbance, light sensitivity, and noise sensitivity dropped at least two ranks, with the elimination of nausea. Her headache severity dropped one point, with fewer than one migraine per week, even less frequently than before her injury. On repeat exam, her vestibulo-ocular disturbances resolved. A repeat Osteopathic exam revealed resolution of somatic dysfunctions in the cranial field, but remaining findings of a left superior clavicular head and left levator scapulae spasm.

Discussion

A 2021 systematic review of randomized controlled trials demonstrated that optimal first-line treatments in PCS are physical therapy and cognitive behavioral therapy (CBT).[7] We advised CBT as a treatment option with the patient, but she expressed apprehension and ultimately declined this treatment option after discussing its risks and benefits. Considering she had minimal relief from physical therapy and declined CBT, we chose to pursue the treatment potential of OMT.

We approached her OMT with a combination of the evidence-based protocol described by Mancini et al., case reports of treating PCS with OMT, and a rational anatomic understanding of lymphatic and venous drainage.[8,9] We treated proximally to distally to decongest lymphatic drainage, beginning by decompressing the thoracic outlet with muscle energy for the superior clavicular head. Then, we opened the thoracic inlet with the necklace myofascial technique. Next, we used cranial venous sinus drainage to promote the removal of inflammatory waste products and permit the healing of injured tissue. Next, we treated orbital restrictions with direct myofascial release, nasofrontal and maxillo-lacrimal suture restrictions with the nasion spread technique, and the left torsion with balanced membranous tension to minimize irritation of involved sensory afferents with orbital movements. Lastly, we used lumbosacral decompression to restore craniosacral motion.[10-12] Figure 2 demonstrates these OMT techniques.

Based on her brief but significant relief from an occipital nerve block, we chose therapeutic exercises of dynamic cervical flexion and levator scapulae self-stretching to strengthen weak anterior cervical flexor and facilitated suboccipital extender musculature (Figure 3). Figure 3 demonstrates these exercises. Because she took migraine and depression medications as directed with minimal relief, medication optimization was a crucial part of her care.

The PCSS is a validated measure of mTBI recovery consisting of a 22-item self-reported questionnaire investigating concussion-associated symptom severity. A 2022 cohort study demonstrated the PCSS was highly responsive to change as patients underwent a postconcussion recovery program. In a different study, investigators demonstrated decreased PCSS scores strongly correlate with increased neurocognitive activity on functional MRI, so the patient's 15-point reduction indicates a high likelihood of improved neurocognitive physiology post-OMT.[13,14]

Conclusion

Based upon the current case, OMT should be seen as a useful treatment modality for those with PCS post-mTBI despite the limited data available. The case demonstrated that OMT in PCS post-mTBI ameliorated or resolved each of the patient's most distressing symptoms. Identifying OMT as a useful treatment modality for PCS post-mTBI is significant due to the limited effectiveness and variety of first-line PCS treatment options. Considering a large proportion of individuals will develop PCS post-mTBI, it is in each patient's best interest for Osteopathic physicians to be aware of the potential effect they can impart with OMT to address associated symptoms.

ACKNOWLEDGEMENTS

The authors declare that they have no relevant material or financial interests that relate to the case described in this paper.

The patient gave her consent to present her case.

Special thanks to: Katie Neuer, D.O.

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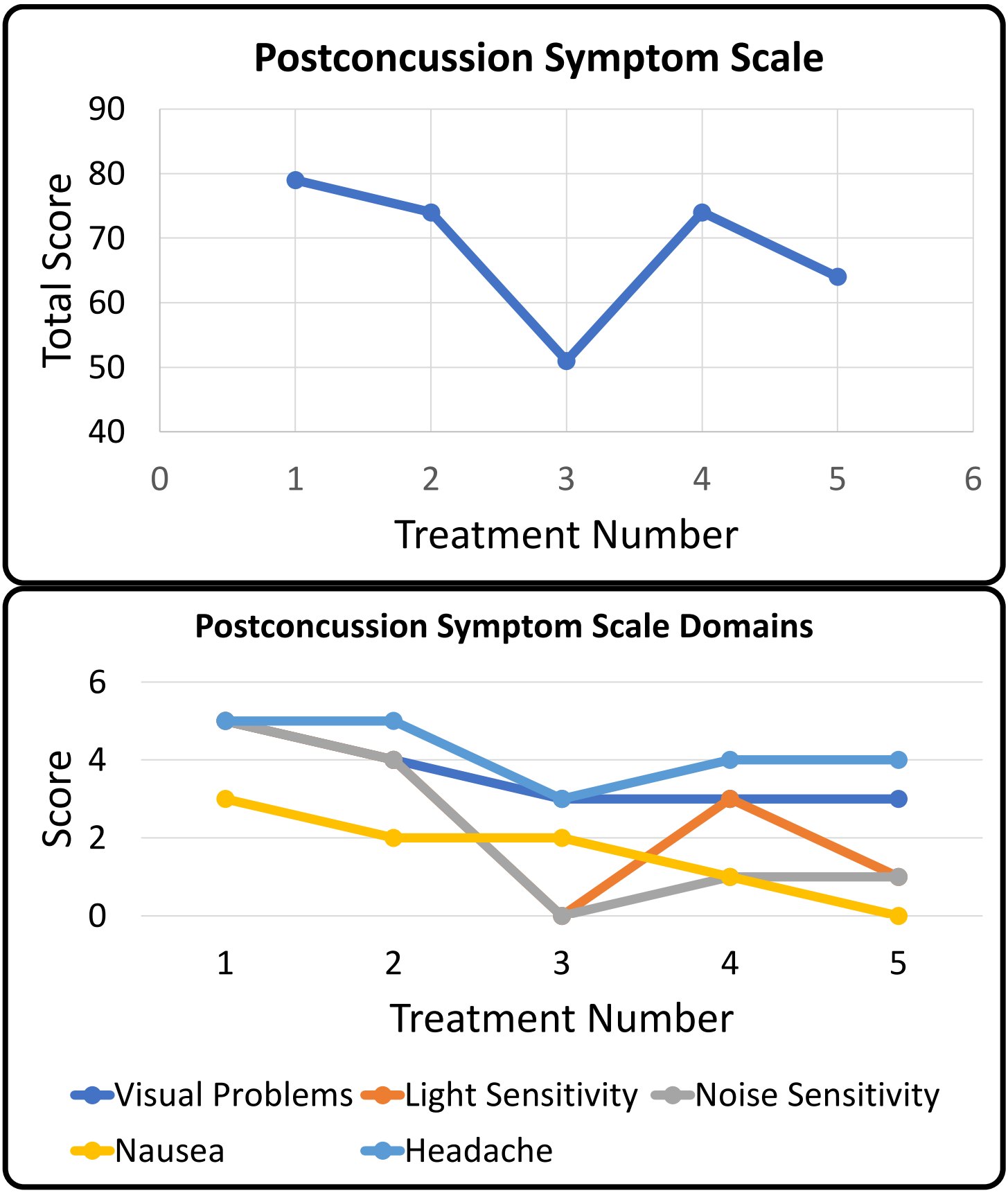

Figure 1: Postconcussion symptoms scale total scores and individual domain scores across each treatment week.[13,14]

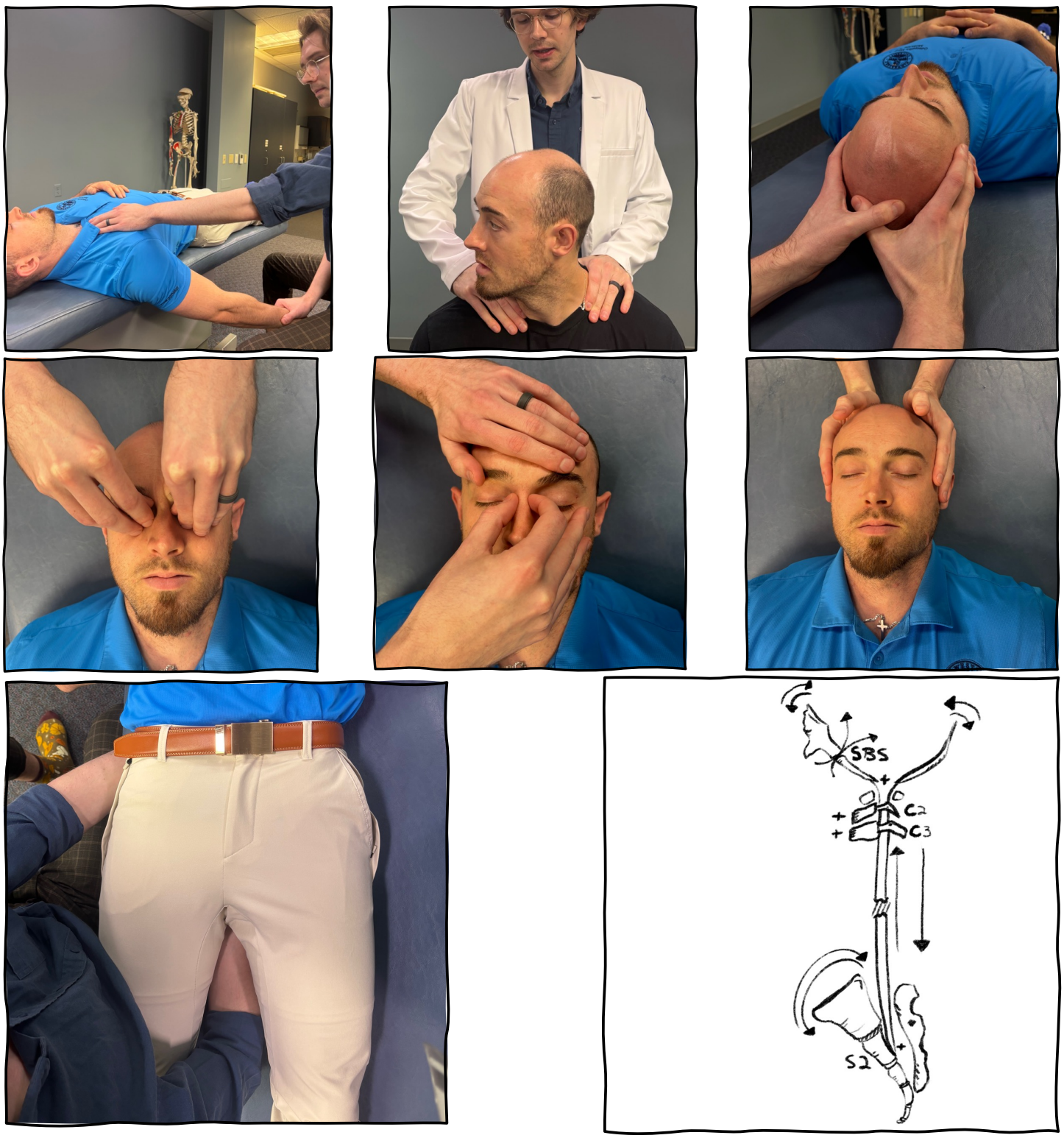

Figure 2: Demonstration of Osteopathic manipulative techniques pictured from left to right: Superior clavicular head muscle energy. Necklace technique for myofascial release of the thoracic outlet. Venous sinus drainage. Orbital myofascial release. Nasion spread technique. Balanced membranous tension. Lumbosacral decompression. Illustration of the cranial primary respiratory mechanism: SBS: Sphenobasilar synchondrosis.[10-12] Demonstration pictures used with kind permission from Anthony Ennis, OMS-III.

Figure 3: Demonstration of exercise prescription pictured from left to right: Dynamic cervical flexion. Levator scapulae self-stretch.

Title: Colonic Tuberculosis: A Rare Etiology of Anemia Unveiled

Authors and Affiliations

1. Tanya Hsiung, Midwestern University, OMS3
2. Faisal Mehmood, MD, Honor Health, Gastroenterology Fellow
3. Joseph Fares, MD, Honor Health, Gastroenterology Physician
4. Kevin Gilchrist, MD, Honor Health, Pathology Physician
5. John Ashurst, DO, Midwestern University, Physician

Objectives:

Colonic TB can present many ways and we hope to share its presentation in the context of the the etiology of anemia in a middle-aged man who had pulmonary TB.

Introduction:

Extrapulmonary tuberculosis (TB) accounts for 1-3% of all TB cases worldwide [1]. Gastrointestinal (GI) TB more commonly affects immunocompromised patients. It can present with abdominal pain, appetite loss, weight loss, fever, bleeding per rectum, changes in bowel patterns, or anemia. Diagnosis is confirmed on histopathology showing non-caseating granuloma and chronic inflammation [3].

Case Description:

A 60-year-old male who immigrated from Mexico presented to the hospital with 3-month history of generalized weakness, abdominal pain, anorexia, and 30 lb unintentional weight loss. He reported having melena and bright red blood per rectum. He was not taking NSAIDs or anticoagulants. He denied fever, chills, or cough. His family history was unremarkable. He denied having any recent sick contacts. His past medical history included polymyositis and was chronically taking prednisone.

He had hemoglobin of 10 g/dL with normal platelets and INR. Computerized tomography of the chest and abdomen showed a massive cavitary lesion in the left upper lobe measuring 11.2cm with multiple small cavitary nodules in both lungs (figure 1). He underwent extensive workup including bronchoalveolar lavage with cultures and was found to have pulmonary TB. He started on antituberculosis treatment. Hospital course was complicated by worsening anemia requiring multiple blood transfusions. Repeat CTA abdomen showed a small focus of enhancement at the proximal sigmoid colon, suggesting a small area of active bleeding (figure 2).

Esophagogastroduodenoscopy showed mild erythema in the gastric antrum and duodenum. Colonoscopy revealed severe patchy inflammation in the terminal ileum, and multiple ulcers in the colon with no stigmata of recent bleeding (figure 3a-b). Biopsy confirmed acid-fast bacilli within specimens from the terminal ileum and right-sided colon (figure 4a-b).

Discussion:

Gastrointestinal TB requires a high index of suspicion to diagnose because of the nonspecific eatures, which overlap with GI infections, inflammatory diseases, and malignancy.

Conclusion/Outcomes:

This case highlights a patient with risk factors including immigrating from an endemic region, immunosuppression, and symptoms of abdominal pain and weight loss.

Acknowledgement/Disclosure: No disclosures

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Graphic Elements:

Figure 1 CT chest

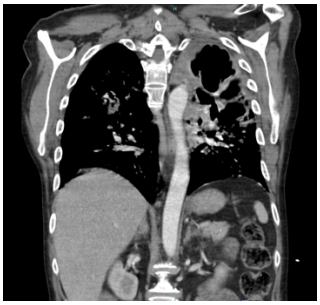


Figure 2 CT abdomen

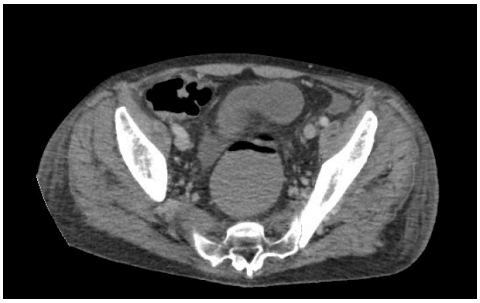


Figure 3a-b Colonoscopy

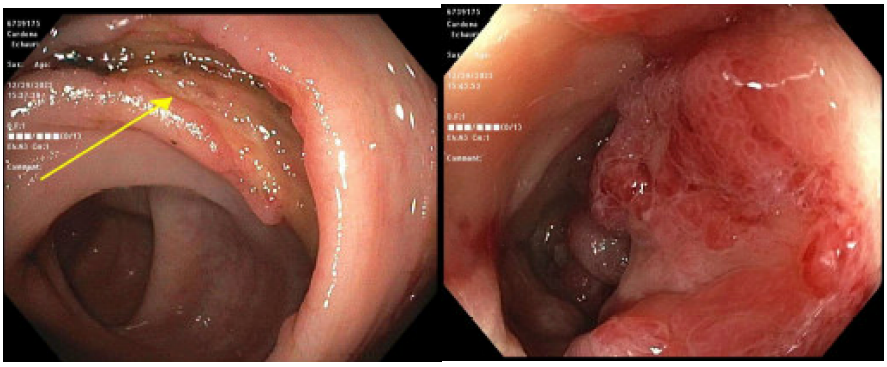
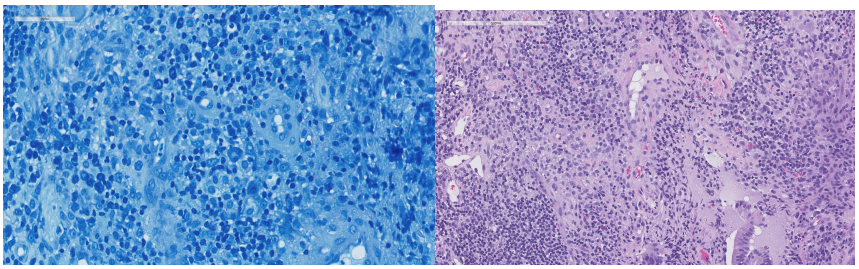


Figure 4a-b Biospy showing AFB



AOMA 2024 – Clinical Case Poster Category

Title: ***Erosive Pustular Dermatosis of the Scalp Following Seborrheic Dermatitis Successfully Managed with Polymeric Membrane Dressings***

Authors: Henry Jeon, OMS-III; John Ashurst, DO, DEd; Keith Mackenzie, DO

Affiliations: Midwestern University Arizona College of Osteopathic Medicine; Mackenzie Dermatology

Objective

We report the second documented case of successful management of erosive pustular dermatosis of the scalp (EPD). This report highlights seborrheic dermatitis as an etiology for EPD and discusses a less invasive therapeutic option.

Introduction

EPD is a rare condition that typically presents with a mixture of asymptomatic, sterile, crusted erosions and ulcerations, pustules, surrounding atrophy, and alopecia on the vertex of the scalp. Etiology and pathogenesis are poorly defined, but common triggers include history of trauma, medications, radiotherapy, and infections. EPD is managed with topical corticosteroids, occasionally with calcineurin inhibitors or photo-dynamic therapy.

Case Description

We report a 45-year-old female patient who presented with cloudy fluid leaking from a non-painful, non-pruritic lesion on her scalp that she first noticed 4 weeks ago. She reported rapid growth and bloody drainage of the lesion. Past medical history included seborrheic dermatitis, psoriatic arthritis, type 2 diabetes mellitus, hyperlipidemia, chronic kidney disease, deep vein thrombosis, morbid obesity, and a pediatric hypothalamic astrocytoma status post neurosurgical tumor resection with multiple complications. Local skin examination revealed a 4.0 x 2.3 cm shallow erythematous ulcer with extensive heme crusting, overlying scales, and purulent drainage on the anterior vertex of the scalp, above her neurosurgery scar, associated with surrounding alopecia and skin atrophy. Significant seborrheic dermatitis was present surrounding the ulcer.

Discussion

Debridement and wound care were initiated, followed by application of a polymeric membrane dressing. Bacterial cultures were negative for growth but revealed fungus, likely contaminants from the seborrheic dermatitis. Upon follow-up four days later, the ulcer measured 1.5 x 1.2 cm and wound care was continued. Seborrheic dermatitis induced local immune dysregulation and disruption of epithelial integrity may have been a trigger for EPD. A conservative approach was taken as an immediate biopsy of the lesion or prematurely initiating topical corticosteroids may lead to poor patient satisfaction and outcomes due to adverse effects.

Conclusion

This is the second case of EPD successfully managed with dressings to our knowledge. We identify seborrheic dermatitis as a potential trigger for EPD and provide insight into potential conservative management strategies through polymeric membrane dressings and wound care.

Rattlesnake bite complicated by anaphylactic shock and rhabdoymyolysis: a case report

Authors
Aurelia C. Kucera, DO, PhD, PGY-2[1]
Bailey J. Hasenbalg, DO, PGY-3[1]
Ordessia Charran, MD[2]

[1] Kingman Regional Medical Center Emergency Medicine Residency
[2] Kingman Regional Medical Center Department of Critical Care

Objectives
This report describes an usual presentation and clinical course of anaphylactic shock and rhabdomyolysis after rattlesnake envenomation.

Introduction
While rarely fatal in the United States, rattlesnake envenomation often causes significant morbidity, typically including localized tissue destruction and coagulopathy. Anaphylactic reactions and rhabdomyolysis are both uncommon consequences of rattlesnake envenomation.

Case Description
A generally healthy middle-aged adult patient presented to the emergency department with unstable vital signs and difficulty breathing shortly after sustaining a rattlesnake bite to the finger. Presenting vital signs were tachycardic, hypotensive, and saturating in the low 90s on 15 liters oxygen by non-rebreather mask. The patient was immediately treated for anaphylactic shock, requiring an epinephrine drip and supplemental oxygen by non-rebreather mask. The patient was also treated with crotalid antivenom in the emergency department with additional doses administered during hospitalization. After admission to the intensive care unit (ICU), the patient went on to develop rhabdomyolysis with creatine kinase levels above the quantifiable range. The patient required five days of ICU care and was discharged home on hospital day 7.

Discussion
Anaphylaxis and anaphylactoid reactions infrequently complicate rattlesnake envenomation, and severe anaphylaxis can lead to additional complications involving multiple organ systems. Rhabdomyolysis occurs due to myocyte injury or death, and has multiple triggers, including anaphylaxis, hypotension, and myotoxins.

Conclusions
This case illustrates that complications of rattlesnake envenomation can be severe and life-threatening, both immediately after exposure and developing over days. Management of anaphylactic shock and rhabdomyolysis are discussed, as well as indications for crotalid antivenom.

Abstract

Hyperthyroid Heart Disease: Death of Women during COVID 19 Pandemic

Breena Miller, MS-III, Esteban Rios, MS-II Paulette Kourouma, MS-II, John Hu, MD, PHD

A.T. Still University, School of Osteopathic Medicine

Objectives: Emphasize the importance of hyperthyroidism management in the prevention of cardiovascular complications. Recognizing the challenges pandemics impose on healthcare outcomes.

Background: Hyperthyroidism is well-documented to alter hemodynamics and cause tachycardia, atrial fibrillation, increased cardiac output, and heart failure.[1] Hyperthyroidism can also cause systemic and pulmonary hypertension, high-output heart failure, and cardiomyopathy.[2,3] Dilated cardiomyopathy associated with hyperthyroidism is rare, occurring in less than 1% of patients.[5] 6% of patients with hyperthyroidism have cardiomyopathy.[6]

Case Description: A 26-year-old female diagnosed with hyperthyroidism received antithyroid medication treatment in 2019. Clinical assessment over years, including imaging studies, showed tachycardia, hypertension, abnormal electrocardiogram, pulmonary vascular congestion, and increasing cardiomegaly when compared with the Chest radiograph in 2017. Multiple ER visits in early 2021 for back pain, asthma, and dyspnea and an endocrinologist visit in mid-2021, prompted a desire for thyroid surgical intervention. She had uncontrolled hyperthyroidism with labs including a TSH of <0.1 MU/L and Free T4 of 7.7ng/dL. Her hyperthyroidism required strict medical management before pursuing surgical intervention. She died later that night.

Autopsy performed two days after death showed pathologic findings indicative of congestive heart failure(CHF), pleural and pericardial effusions, and ascites. Other findings were cardiomegaly (weight 740 grams) (normal 176 to 416 grams,[10]) with all chambers markedly dilated, left ventricular hypertrophy, and diffusely enlarged thyroid glands bilaterally.

Clinical presentation and gross and microscopic findings confirmed diagnosis of diffuse toxic goiter and dilated cardiomyopathy. The patient died from dilated cardiomyopathy with CHF, most likely due to uncontrolled hyperthyroidism.

Discussion: The hyperthyroidism and cardiomyopathy ultimately led to her death. The extent of cardiomegaly (more than two-fold increase) is beyond untreated prolonged hypertensive heart disease. Cardiomyopathy is the consequence of poorly controlled hyperthyroidism. Studies have shown that medical treatment can reduce the CHF rate and surgical removal may achieve better outcomes.[7,8] The negative impact of the pandemic to hospital functions possibly delayed the diagnosis and treatment of hyperthyroidism in this case.

Conclusion: This case illustrates that poorly controlled hyperthyroidism may lead to or expedite the development of cardiomyopathy.

Title: Sleeping Soundly: An Osteopathic Approach to Insomnia in an Adolescent
Authors: Ryan Orlando, OMS-IV[1], Christina Martin, DO[1]
Affiliations: [1]Arizona College of Osteopathic Medicine, 19555 N 59th Ave, Glendale, AZ 85308

Introduction

Patients with insomnia disorder experience reduced quality of life and increased risk for multiple chronic diseases, and between 10%-30% of adolescents have insomnia disorder[1]. Many conditions cause insomnia symptoms, including hyperthyroidism, sleep apnea, depression, anxiety, and bipolar disorder. If these are ruled out, management of primary insomnia disorder includes supplements, sleep hygiene instructions and cognitive behavioral therapy. Sleep medications can also provide relief; however, they may cause side effects and addiction. There exists a need for effective alternative modalities to improve sleep symptoms. While osteopathic research on insomnia is limited, particularly in the adolescent population, it finds significant benefits of OMT on sleep quality and latency[2,3].

Case Description

A 17-year-old female presented to a family medicine clinic with 5 months of difficulty falling and staying asleep. She had been educated on sleep hygiene and tried diphenhydramine and melatonin for three months without relief before starting trazodone two months prior. Trazodone helped her fall asleep faster, yet she was still unable to maintain sleep after four hours. Neurologic, cardiovascular, and psychiatric exams were normal. Laboratory findings include TSH and free T4 within normal range. Her PHQ-9 and GAD-7 ruled out depression and anxiety, and the Insomnia Severity Index (ISI)[4] indicated severe-level clinical insomnia.

Discussion

An osteopathic structural exam revealed OMT was indicated. Techniques performed on the patient included rib raising, suboccipital release, sphenopalatine ganglion release, and compression of the fourth ventricle, among others. After three visits, her daytime sleepiness reduced, early awakenings were eliminated, and her well-being and daily functioning improved. Also, the ISI indicated only a subthreshold-level insomnia. She also voluntarily ceased taking trazodone and sleep supplements after the first OMT visit.

Conclusion

A few research papers and case studies[5,6] exist showing the benefits of OMT on sleep, and none include adolescents. We present a case of insomnia in an adolescent, which had not responded adequately to lifestyle changes and medical therapy, that found dramatic improvement with OMT. By treating this patient's autonomic nervous system and cranial structures, we provided long-awaited relief for her while eliminating her need for medication, highlighting the value of OMT in her treatment plan.

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AOMA Clinical Case Poster Submission Abstract
02/04/2024
Tyler Orosz, OMS III
Midwestern University

Title: A Grave Gallbladder: A Case Report

Authors: Tyler M. Orosz[1], Debora J. Fox-McClary[1,2,3], J. Brian Brizendine[2,3]

Affiliations:
[1] Midwestern University College of Osteopathic Medicine, Glendale, Arizona
[2] Division of General Surgery, Department of Surgery, Abrazo Arrowhead Campus, Glendale, Arizona
[3] Phoenix Unified Surgeons, Phoenix, Arizona

Abstract: Gallbladder cancer, though rare, poses significant diagnostic and therapeutic challenges due to its insidious onset and aggressive behavior. This case involves a 73-year-old female who initially presented with right upper quadrant (RUQ) pain, was diagnosed with acute cholecystitis, and subsequently underwent laparoscopic cholecystectomy which revealed an incidental grade 3 adenocarcinoma. The patient survived only 15 days post-discovery. This case highlights the importance of considering gallbladder cancer in cases of vague abdominal symptoms.

Introduction: Gallbladder cancer, constituting 1.2% of all cancer diagnoses globally, exhibits a propensity for late-stage diagnosis, resulting in a mean survival time of six months. It is more common in women and associated with risk factors such as gallstones, obesity, smoking, and multiparity. Geographical variations in incidence suggest environmental and regional factors play a role.

Case presentation: A 73-year-old women with extensive medical history including recurrent RUQ pain presented with RUQ pain, elevated ALT/AST, normal bilirubin, and RUQ ultrasound findings concerning for acute cholecystitis. Subsequent surgical intervention revealed an advanced stage gallbladder cancer. After stabilization and discharge, patient presented back 5 days later with jaundice, bilirubin of 10.2, elevated AST/ALT, and ALP of 1883. Subsequent evaluation with ERCP lead to aspiration of gastric contents and sudden cardiac arrest. After 5 rounds of CPR, patient was pronounced dead.

Discussion: The subsequent discussion explores the limitations of current screening practices, biomarkers' lack of specificity, and imaging ambiguities. The case also underscores the high incidence of incidental gallbladder cancer findings after surgery, contributing to the challenges in its management. The case's retrospective analysis highlights the inadequacy of a simple cholecystectomy for incidental advanced-stage gallbladder cancer, advocating for more accurate diagnostic tools to guide appropriate surgical approaches.

Conclusion: In conclusion, gallbladder cancer, despite its low prevalence, presents significant clinical challenges. This case report underscores the need for improved early detection methods, diagnostic precision, and therapeutic interventions. A multidisciplinary approach, incorporating advances in imaging and molecular profiling, is crucial for enhancing patient outcomes. The case contributes to the growing body of knowledge on gallbladder carcinoma, aiming to raise awareness given its deceptive clinical presentation similar to other biliary pathologies.

A Rare Case of Exercise Induced Anaphylaxis

Authors: Sarah Petrides, OMS-III MPH, Midwestern University
Corinne Jedynak-Bell, DO MBA, FACOOG, Midwestern University
John Ashurst, DO, Midwestern University

Objectives: Exercise-induced anaphylaxis (EIA) is a rare but potentially life-threatening condition characterized by the onset of symptoms such as urticaria and angioedema during or following physical activity. This case report aims to discuss a case of EIA in a 23-year-old female, emphasizing the urgency and complexity of its clinical manifestations.

Introduction: Exercise-induced anaphylaxis is an IgE mediated hypersensitivity reaction, characterized by the sudden onset of allergic symptoms during or after physical exertion. While urticaria is more common, the emergence of angioedema and respiratory symptoms, as seen in this case, represents a more severe manifestation of EIA. Existing literature underscores the variability and infrequency of the presentation of EIA.

Case Description: A 23-year-old female with a one-year history of exercise-induced urticaria presented urgently to the clinic after experiencing angioedema and wheezing for the first time following exercise. The patient reported associated symptoms of throat swelling and chest tightness while exercising the night prior. The patient attempted to self-treat with antihistamines. She stated that prior episodes of urticaria resolved within 2 hours of stopping exercise. She reported no comorbidities, nor prior history of allergies or asthma. The patient exercised 30 minutes before the clinic visit to ensure symptom presence. Physical exam revealed diffuse urticaria over the body, sparing the palms and soles. She was advised to discontinue exercise, prescribed an epinephrine auto-injector, initiated on cromolyn sodium, and referred to an allergist for further evaluation.

Discussion: The diagnostic workup involved excluding other causes of exercise-related symptoms such as exercise-induced bronchoconstriction and other anaphylactic triggers. The characterization of symptoms as well as the absence of other allergies or asthma history, supported the diagnosis of EIA. The discussion also considers the challenges in diagnosing and differentiating EIA from other allergic disorders.

Conclusions: This case report highlights the clinical complexity of EIA and emphasizes the need for awareness amongst physicians. Prompt recognition and appropriate management, including lifestyle modifications and pharmacotherapy, are crucial in preventing potentially life-threatening episodes. The patient's response to prescribed interventions and the subsequent allergist evaluation will contribute to ongoing discussions on the standard of care of individuals with exercise-induced anaphylaxis

Title: A case report of a paraneoplastic lichen planus associated with angioimmunoblastic T-cell lymphoma

Authors: Creighton Pfau, B.S.3, Hanna Ozbeki B.S.3, Kelly Frasier, D.O., M.S.1, Saad Javaid, M.D.1, Mikayla Cochrane, B.S.2

1 Wyckoff Heights Medical Center, Department of Internal Medicine
2 Sidney Kimmel Medical College at Thomas Jefferson University
3 A.T. Still University School of Osteopathic Medicine Arizona

Objectives

An original case report of a paraneoplastic lichen planus rash in the presence of a patient newly diagnosed with angioimmunoblastic T-cell lymphoma (AITL) provides insight to a rare cutaneous finding that corresponds to AITL.

Introduction/Background

Angioimmunoblastic T-cell lymphoma (AITL) is an aggressive rare subtype of non-Hodgkin lymphoma associated with poor prognosis. Cutaneous involvement with an often-non-specific type of generalized morbilliform rash is commonly associated with AITL. Lymph node biopsy, skin biopsy, and bone marrow biopsy can be utilized when making the diagnosis of AITL. AITL has a highly aggressive course and poor outcome despite chemotherapy and radiotherapy.

Case Description

The present case study reported on a 70-year-old male patient presenting with a generalized diffuse morbilliform rash on the extremities, trunk, face, and neck originally diagnosed via skin biopsy as lichen planus pemphigoides. The patient arrived complaining of “boils” all over his skin which began 2 months ago. A complete blood count (CBC) showed white blood cells (WBC) 26.10 K/UL, neutrophils 81.1%, and lymphocytes 4.9%. The remainder of his labs were within normal limits. Patient non-reactive for hepatitis, QuantiFERON-TB Gold, and HIV.

Discussion

One day prior to his presentation the patient had an outpatient skin biopsy performed, which showed a pattern of linear basement membrane zone deposition with multiple conjugates. consistent with a subepidermal autoimmune mucocutaneous blistering disorder including bullous pemphigoid, epidermolysis bullosa acquisita, bullous systemic lupus erythematous, or anti-collagen IV pemphigoid. At this time, the patient also had leukocytosis with banding at presentation, associated with cervical and supraclavicular lymph node enlargement. Osteopathic manipulations were contraindicated in this patient due to malignant spread potential.

Conclusions/Outcomes

After an excisional cervical lymph node biopsy, the patient was diagnosed with AITL. Desmoglein 1 and 3 were, making the morbilliform rash more likely due to an immune response secondary to AITL. This case demonstrates an uncommon presentation of angioimmunoblastic T-cell lymphoma for physicians to be aware of.

The Grass Isn't Always Greener: Cannabinoid Hyperemesis Syndrome (CHS)
Case Vignette

Ezgi Ulger OMS III

Learning Objectives:

1. Recognize the clinical presentation of cannabinoid hyperemesis syndrome
2. Treat cannabinoid hyperemesis syndrome
3. Counsel patients who may be suffering from cannabinoid hyperemesis syndrome

Introduction:

Cannabinoid Hyperemesis Syndrome (CHS) can be identified as intractable nausea/vomiting and abdominal pain occurring within 24 hours of last cannabis use.[2,7] Often these symptoms occur among near-daily users and resolve when individuals abstain from cannabis, take hot showers, and/or receive a certain medication regimen.[1,2,7]

Case Description:

A 48-year-old male presents to the ED due to ongoing nausea and vomiting for four days. He reports diffuse abdominal pain because of intractable vomiting and lack of food intake. He regularly uses cannabis and denies recent alcohol use. Two days ago, he came to the emergency department for the same concerns. A CT scan of abdomen pelvis, CBC with diff, BMP, LFT, Lipase, Urinalysis were grossly reassuring in context. During the second visit, 5 mg Haloperidol, 1,000 mL of Sodium Chloride 0.9%, and 2 mg/mL Morphine were given which resulted in drastic improvement of his condition.

Discussion:

CHS is often underdiagnosed, medically over tested, and costly to manage.[7] There are many reasons for this, one of which is because there is no definitive diagnostic criteria for CHS.[7] Since it's based on a clinical diagnosis, it requires excluding other etiologies for the symptoms. In general, standard antiemetics such as ondansetron and metoclopramide are almost always ineffective when administered initially.[7,8] It is suggested to use an isotonic solution for replenishing fluids in patients as well as administer Droperidol or Haloperidol for mitigating hyperemesis.[4,5,6,8] Additionally, capsaicin cream has been found to provide pain and vomiting relief.[2,3,6] Nevertheless, abstinence from cannabis is the only definitive treatment.[1,6]

Conclusions:

Overall, there is much to learn about CHS. More research is necessary to determine the underlying pathophysiology, definitive diagnosis and treatment regimen. In the meantime, it is important to be aware of what is currently known about CHS to efficiently treat it without repeat testing, excessively using resources, and prolonging patient discomfort.

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AOMA 2024 – Clinical case poster category

Title: ***Ovarian cyst induced meralgia paresthetica***

Authors: Henry Jeon, OMS-III; Albert Wang, OMS-III; Stacia Kagie, DO; John Ashurst, DO PhD

Affiliation: Midwestern University Arizona College of Osteopathic Medicine, Glendale, AZ

Objective: We report a case of right-sided meralgia paresthetica (MP) secondary to a right adnexal mass. Ovarian masses causing MP is a very rare presentation, only being reported twice in literature. This report aims to highlight the importance of identifying uncommon and internal triggers of MP.

Introduction: MP is a mononeuropathy of the lateral femoral cutaneous nerve that typically presents with numbness, tingling, or neuropathic pain along the anterolateral thigh. MP commonly presents in individuals in their fifth decade who are obese, diabetic, or in individuals who wear tight clothing. Management of MP is highly variable but includes surgical decompression, medications to relieve neuropathic pain, and behavioral modifications. Tissue tension releasing osteopathic manipulative treatment and active stretching has also been shown to improve symptoms through the combination of relieving the compression on the nerve. MP is well described in current literature but cases arising from intra-abdominal masses are poorly documented.

Case Report: We report an 83-year-old female patient who presented with intermittent burning sensation along her right lateral thigh that has been worsening over the past year. Abdominal ultrasound revealed a mass measuring 9.3 x 7.1 x 9.6 cm initially, increasing in size to 11.3 x 7.6 x 9.5 cm one month later. Physical examination revealed decreased sensation along the right lateral thigh to midline anterior thigh.

Discussion: A diagnosis of right-sided meralgia paresthetica was made based on clinical findings, likely secondary to compression by her large right-sided adnexal simple cyst. The patient declined surgical intervention and requested conservative management with close observation. Although MP is a common neurological condition, it is possible for physicians to overlook internal triggers such as mass lesions. Recognition of clinical clues and extensive history taking is necessary in proper diagnosis and treatment of underlying processes that induce MP.

Conclusion: MP is a condition that presents with paresthesia or dysesthesias due to compression of the lateral femoral cutaneous nerve, relieved by treating the underlying cause or avoiding behavioral triggers. This is a case of MP induced by a large simple ovarian cyst, an uncommon etiology, managed without surgical intervention.

TITLE: From Nipple Injury to the Discovery of a Rare Case of Li-Fraumeni Syndrome in a 24-Year-Old Female

AUTHORS: Alice C Yen, BS[(1)], Lalita Pandit MD[(2)], William Peppo DO FACOI FCCP FACP[(1)]

AFFILIATIONS: [(1)]Arizona College of Osteopathic Medicine, Midwestern University, [(2)]Lalita Pandit MD Inc

OBJECTIVES: This case illustrates an unusual presentation of breast cancer in a non-healing wound and brings awareness to Li-Fraumeni Syndrome (LFS).

BACKGROUND: LFS is an inherited autosomal dominant disorder that is associated with a mutation of the tumor suppressor gene, TP53. This mutation predisposes individuals to the development of the following tumors: premenopausal breast cancer, osteosarcoma, soft tissue sarcoma, brain tumors, adrenocortical carcinoma, and leukemias.[1] Li-Fraumeni is rare with only about 500 families with LFS reported in the literature.[2] The average age for first cancer onset in LFS is 17 in males and 28 in females.[3]

CASE DESCRIPTION: 24-year-old female presented to the ER with left breast changes over one year after her left nipple was accidentally bitten off by her boyfriend. She was treated with antibiotics, but her wound continued to worsen and she was referred to the ED by her PCP.

On physical exam, masses were palpable underneath a 7cmx7cm fungating mass of the left breast. CBC showed an elevated WBC count. Initial biopsy showed suppurative granulomatous inflammation and was negative for atypia or malignancy. However, due to high suspicion for cancer, a second biopsy was done, which again could not confirm cancer. Breast MRI revealed a heterogeneous enhancing subareolar mass of the left breast compatible with malignancy, an enlarged left axillary lymph node, and multiple suspicious right breast masses. Due to the breast MRI being most consistent with malignancy, a partial left breast mastectomy was performed. Pathology of the lumpectomy was able to confirm infiltrating ductal carcinoma. Genetic testing revealed BRCA 1 and 2 negative, but a positive TP53 pathogenic variant consistent with Li-Fraumeni. Chemotherapy was started and the patient received genetic counseling.

DISCUSSION: Differential diagnoses included abscess, chronic mastitis, and malignancy. Work-up included ultrasound, CT, PET, MRI, bone scan, multiple biopsies, and genetic testing. Breast cancer was eventually identified and tests proved Li-Fraumeni.

CONCLUSION: The possibility of breast cancer in a non-healing breast wound should be considered. Cancer in young adults prompts further genetic testing. This case also emphasizes the importance of correlating imaging, biopsy, and physical exam in clinical decision-making.

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Title

Effect of Text Message Reminders on Cervical Cancer Screening Rates at the Center for Comprehensive Health Practice (CCHP): A Quality Improvement Study

Authors and Affiliations

● Annie Tram Anh Nguyen, OMS-III Lead Investigator ● Anna Nidhiry, OMS-III Lead Investigator ● Mariely Fernandez, MD Center for Comprehensive Health Practice Chief Medical Officer ● Sharon Chu, MD, MPH Faculty Advisor

Objectives

Determine the effectiveness of text messaging as an intervention to increase cervical cancer (CCS) screening rates by 20% at an East Harlem clinic.

Introduction/Background

In New York, cervical cancer incidence is higher in non-Hispanic Black women and Hispanic women with cervical cancer mortality being highest in non-Hispanic Black women[1]. Lower SES boroughs are shown to have 73% higher rates of incidence of cervical cancer where predominantly Black and Hispanic communities also reside[2]. It is critical to develop targeted interventions such as text message reminders as a wide-reaching tool to increase CCS rates in these populations.

Methods

We conducted a retrospective chart review to include all eligible patients in accordance with the U.S. Preventive Services Task Force recommendations for CCS at the CCHP. We recorded demographic data, ensuring that patients were text-enabled via the electronic medical record (EMR). Investigators then sent text message reminders to schedule their pap smear. After the intervention period, we recorded whether each patient scheduled an appointment. This data was analyzed to determine the effectiveness of the intervention.

Results/Summary

Based on an EMR screening tool, 484 patients were identified as not compliant with their CCS. Of these patients, 410 patients were text-enabled. A retrospective chart review showed that 187 patients were actually compliant (45.61%) and 223 patients were not compliant (54.39%). The non-compliant patients were sent text message reminders to schedule an appointment for their pap smear. Post-intervention, within a one month period, 6.3% of patients scheduled an appointment. As a follow up, we aim to send a second round of text-message reminders to this cohort to examine the additional barriers that may prevent patients from scheduling appointments.

Conclusion

This quality improvement study showed a potential for text-messaging reminders to improve CCS follow-up in underscreened populations within a one-month window. We found discrepancies in the number of patients identified by the EMR as “compliant” and “non-compliant” versus those that were actually non-compliant after an in-depth chart review. This information can be used to modify screening methods for a more accurate picture of CCS rates and integrate text-message reminders as a tool to improve follow-up care.

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Emerging Dynamics in Otolaryngology Research: The Past, Present, and Future

Kush Amin B.S.[1], Luv Amin B.S.[2], Muhammad S. Ghauri M.S.[2], Henry Jeon B.S.[1], John Ashurst D.O.[1]
[1] Midwestern University, Arizona College of Osteopathic Medicine, Glendale, AZ
[2] California University of Science and Medicine, School of Medicine, Colton, CA

Objective:
The study aims to identify recent trends in Otolaryngology research funding by analyzing NIH grants to inform physicians of most funded diseases and aid researchers in constructing funding worthy projects. We hypothesize that there may be significant differences in gender and disease focus when it comes to NIH funding of Otolaryngology research.

Intro:
There is scarce literature on recent trends in NIH funding of Otolaryngology research, therefore conducting analysis may guide funding to where it is most clinically relevant and necessary. Our study explores trends in funding with additional reports on disease focus and Principal Investigator (P.I.) demographics from 2020-2023.

Methods:
The NIH's RePORTER advanced search tool was used to search for R01 grants awarded to Otolaryngology departments. Grants were stratified by year from 2020-2023 and information regarding Principal Investigator (P.I.) demographics and project focus was collected. Descriptive statistics was used to analyze the funding amount, demographics, and project categories.

Results:
From 2020 to 2023, 751 R01 Otolaryngology projects received $360,545,270 in NIH funding. Average funding per project increased by 8.1% to $509,024 by the end of 2023. Significant funding variations were observed based on project category, PI degree, PI rank, and prior funding ($p<0.001$). Individuals with Professor ranks and PhD degrees received the most grants amongst recipients, with Professors receiving 58.8% and PhD holders making up 61.7%. 28.4% of grants went to females; gender did not significantly impact funding amounts. Regression showed that project category significantly predicted funding amount ($p=0.05$). Project focusing on hearing abnormalities composed 41.6% of grants making it the top funded topic with $124,725,703 (33.7%) of total funding.

Conclusion:

The trends in NIH funding for Otolaryngology research appear to favor increasing annual funding while also targeting the most relevant head and neck diseases with the highest disease burden. However, disparities continue to exist in P.I. demographics, specifically in gender as seen from similar studies done for years prior. Our analysis may inform researchers and help guide the NIH in funds allocation for Otolaryngology research.

Methamphetamine and the Cathinone Derivative Methylenedioxypyrovalerone (MDPV) Produce Differential Effects on Prefrontal Neuroinflammation in Rats

V. F. Carfagno, E. K. Nagy, P. F. Overby, J. Leyrer-Jackson and M. F. Olive

Arizona State University-Tempe, Arizona

Objectives: Methamphetamine (METH) abuse is associated with impairments in executive functioning, including working memory, impulse control, and cognitive flexibility, which may result from drug-induced dysfunction of the prefrontal cortex (PFC). Recent evidence suggests that METH produces increases in immune signaling, microglial activation, and neurotoxicity in this region. The current study sought to investigate the ability of repeated binge-like intake of METH in rats to induce neuroinflammation in the PFC. We also examined the effects of the synthetic cathinone derivative methylenedioxypyrovalerone (MDPV), which exerts potent cocaine-like monoamine reuptake blockade and has been reported to induce neuroinflammation. In addition to tissue cytokine levels, we also measured the density of neurons, astrocytes, and microglia in the PFC.

Methods: Separate groups of male and female rats were allowed to intravenously self-administer either METH (0.05 mg/kg/infusion), MDPV (0.05 mg/kg/infusion), or saline in three binge-like access sessions, each 96-hr in length and separated by 72-hr of forced abstinence in the home cage. Three weeks following the end of the third 96-hr session, brain tissue was harvested for multiplex ELISA analysis of cytokine levels and immunohistochemical assessment of neuronal, microglial and astrocyte density and morphology using the cell specific markers NeuN, Iba1, GFAP, respectively.

Results: Rats self-administering METH demonstrated increased levels of CXCL1, CXCL2, fractalkine, IFN-γ, IL-1α, IL-1β, IL-2, IL-6, IL-18, leptin and MCP-1 in the PFC as compared to animals self-administering saline. In rats self-administering MDPV, only increases in levels of IL-6 in the PFC were observed, which were specific to male rats. No differences in PFC neuron or astrocyte density were observed, although we found an unexpected decrease in the density of microglia in this region. PFC microglia showed reduced territorial volumes and ramification, suggesting an activated inflammatory state.

Conclusions: These results show that neuroimmune activation in the PFC persists several weeks into abstinence following binge-like METH intake. Effects of MDPV on neuroimmune activation appear to be less robust. These findings suggest that targeting neuroimmune response to METH may prove to be effective in facilitating recovery of cognitive function following chronic METH intake.

Support:

This work was supported by NIH grant 1R01DA043172 to MFO

Title: Differences in Authorship Profiles of Incoming Orthopedic Cohorts by Residency Program Institutional Setting

Authors: Daniel Casanova OMSIV, Elliot Jensen OMSIV, Alexandria McGuire OMSIII and John Ashurst DO, DEd, MS for the MWU MIRAGE research lab

Affiliation: Arizona College of Osteopathic Medicine, Department of Assessment

Background: Recent trends in orthopedic residency match have demonstrated an increased emphasis on research productivity during medical school. According to the NRMP, matched DO's and MD's had an average of 7 and 16.5 research experiences, respectively. This difference demonstrates that despite the trends, lower research numbers do not immediately disqualify applicants from consideration. Data suggests that emphasis on research productivity during medical school varies by institution and may be less unanimous than what the data released from the NRMP currently suggests.

Objective: Determine the differences in authorship profiles of incoming residency cohorts by the type of institutional setting of the residency program.

Methods: A retrospective cohort of all orthopedic residents with graduation dates of 2024, 2026, and 2028 who authored publications before January 1st of their matriculation year were included in final analysis. Data abstracted included total number of publications, authorship location on each manuscript, resident demographics, relatedness to orthopedics, and type of article. Only US MD and DO graduates were included in the final analysis. Total publications, topic (orthopedic, other), and author position (1st, 2nd, other) were compared. Kruskal-Wallis with post-hoc Dunn's test for multiple comparisons was used to determine if there were any differences between groups. Statistical significance was defined as $P \leq 0.05$.

Results: 185 orthopedic residency programs containing 2491 orthopedic residents with 8070 publications were reviewed. 21 programs were categorized as Community Hospital, 64 as Affiliated Hospital, and 100 as University Hospital. The median number of total ($p < 0.00001$), orthopedic topic ($p < 0.00001$), other topic ($p < 0.00001$), 1st author ($p < 0.00001$), 2nd author ($p < 0.00001$), and other author ($p < 0.00001$) publications differed significantly between institutional settings. Post-hoc multiple comparisons showed a significant difference in every category ($p < 0.00001$) for University Hospital vs Community Hospital setting and University Hospital vs Affiliated Hospital setting.

Conclusions: Orthopedic residency programs at university hospitals, which comprise 54% of all orthopedic residency programs, are more likely to accept applicants with extensive research experience than are programs at affiliated and community hospitals.

Title:
Comparing Sensitivity/Specificity of Computed Tomography and Ultrasound in the Diagnosis of Acute Cholecystitis in the Rural Setting

Authors:
Lucas Gerbasi, OMS-II; Brian Goss, MD; Tanja Gunsberger, DO; Anthony Santarelli, PhD; John Ashurst, DO, DEd, MSc, FACEP, FACOEP

Affiliations:
Kingman Regional Medical Center, Kingman, AZ. Midwestern College of Osteopathic Medicine, Glendale, AZ.

Background:
Acute cholecystitis (AC) is an inflammatory disease of the gallbladder, caused by gallstones or sludge blockage. Ultrasound (US) and computed tomography (CT) are utilized imaging methods with US being considered the gold standard. Recently, however, CT has shown higher sensitivity/specificity in diagnosing AC in large hospital settings.

Objectives:
To determine the sensitivity and specificity of US and CT for AC at a community hospital. Secondarily, to determine the sensitivity and specificity of specific signs seen on US and CT for AC.

Methods:
A retrospective cohort of patients who underwent US of the right upper quadrant (RUQ) and/or CT of the abdomen and pelvis, followed by pathological evaluation of the gallbladder after surgical removal were included in final analysis. Data collected included patient demographics, laboratory values, symptoms, US findings, CT findings, and pathology results. Imaging signs were recorded based on radiology reports and were considered positive if one sign was present. A true positive for CT and US was recorded if the imaging was positive for AC and the pathological report indicated AC.

Results:
A total of 187 patients who underwent cholecystectomy for abdominal pain with a median age of 60.6 years were included in final analysis. Most patients (90.4%) received a RUQ US, and 65.6% underwent a CT scan before surgery. Sensitivity of US and CT were found to be similar (98.6% and 93.4% respectively) when following a one-sign criterion and US was found to be more sensitive than CT (80.9% and 70.0% respectively) when a two-sign criterion was followed. In a direct comparison between CT and US, US was found to be more sensitive in detecting cholelithiasis and a thickened gallbladder wall (95.9% and 92.3% respectively) while CT was more sensitive in detecting pericholecystic fluid and gallbladder distension (83.6% and 95.7% respectively).

Conclusion:
At a community emergency department, US had a higher sensitivity than CT for detecting AC when using a one or two-sign criterion. From these results, US should continue to be the first line imaging modality in those suspected as having AC.

Title: Representation of Women and Osteopathic Physicians as Editors from Eight Medical Subspecialties

Authors: Samantha Gluzinski OMSII, Scott Farr OMSII, O'Neil Fillon OMSII, Alexander Candel OMSII, Dakota Marshall OMSII, Jacob Ryu OMSII, Zachary Rosson OMSII, Angelique Shumway OMSII, Wyatt Furnell OMSII, Tara Mohanroy OMSII, Julius Vellutato OMSII, Christopher Sleiman OMSII and John Ashurst DO, DEd, MS for the MWU MIRAGE Research Lab

Affiliation: Department of Assessment, Arizona College of Osteopathic Medicine, Glendale, Arizona

Background: Over the last several decades, a growing number of publications have noted that females and osteopathic physicians are under-represented as editors from high-ranking journals. However, little data has compared these numbers to those actually practicing within the specialty.

Objective: To determine the current representation of women and osteopathic physicians on editorial boards from eight medical subspecialties.

Methods: The editorial boards of a cohort of the top five journals from eight medical subspecialties (Dermatology, Critical Care, Endocrinology, Infectious Disease, Cardiology, Hematology/Oncology, Neurology, and Physical Medicine & Rehabilitation) published in the English language based impact factor were reviewed. Editorial board members were categorized based upon their title and divided into the following groups: Editor in Chief, Associate/assistant/Deputy Editor in Chief, Executive/Senior/Section Editors, and Other Editors. Gender was assigned using images or pronouns on research databases or hospital-affiliated website. Medical degree was assigned in a similar manner to gender and all of those without a medical degree were removed from analysis. The total number of female and osteopathic physicians in was determined based upon the 2021 AAMC Physician Specialty Data Report. A binomial proportion test was used to compare the distribution of women and osteopathic physicians serving on editorial boards and the number of women (38.24%) and osteopathic physicians (6.57%) in current practice amongst the specialties reviewed.

Results: A total of 1030 editors were reviewed with being female 36.60% ($p=0.29$) and 0.68% ($p<0.0001$) being an osteopathic physician. Females consisted of 28.13% all editors in chief ($p=0.28$), 31.52% of all Associate/Assistant/Deputy editors in chief ($p=0.20$), 45.95% of all executive/section/senior editors ($p=0.06$), 44.16% of all associate/assistant editors ($p=0.14$), and 33.50% of all editors categorized as other ($p=0.02$). Osteopathic physicians consisted of 0% of all editors in chief ($p=0.27$), 1.09% of all Associate/Assistant/Deputy editors in chief ($p=0.03$), 0% of all executive/section/senior editors ($p=<0.0001$), 0.65% of all associate/assistant editors ($p=0.0008$), and 0.83% of all editors categorized as other ($p<0.0001$).

Conclusion: Overall, females are not under-represented as editors from the journals studied. However, osteopathic physicians only account for a minority of editors and are under-represented on the editorial boards of those journals studied.

Title:
Evaluating Radiology Education in Undergraduate Medical Curricula: Impact on Self-Perceived Clinical Readiness and Competency

Authors:
Omar Guerrero OMS-III[1], William Haynes OMS-IV[1], Umar Syed OMS-II[1], Curt Bay Ph.D.[1], Ellen Savoini Ph.D.[1], Anna Campbell Ph.D.[1]

1. A.T Still School of Osteopathic Medicine in Arizona

Objectives:

- To gather insights from current SOMA students about their medical imaging experiences.
- We hypothesized differing student experience and confidence across academic years, with students valuing radiology-related skills and educational opportunities.

Background:
Despite radiology's crucial role in patient care, radiology exposure in medical education varies by institution, with only 16% of medical schools requiring radiology clerkships since 2018. A study revealed that just 25% of fourth-year medical students were confident in interpreting a chest radiograph (CXR), with only 3.8% rating their imaging interpretation skills as good. This raises concerns about the adequacy of radiology emphasis in undergraduate medical education and whether clinical rotations provide sufficient preparation for residency.

Methods:
During the Spring 2023 term, SOMA students from the classes of 2023-2026 were invited to complete a survey through email. Utilizing Likert scale responses and open-text entries, the survey collected data on exposure, preparedness, and confidence in various imaging modalities during their undergraduate medical education.

Results:
76 students participated in the survey, spanning various academic years: 29% OMS-I, 24% OMS-II, 34% OMS-III, and 13% OMS-IV. Using a Likert scale (1-5), average ratings for identifying normal anatomy in radiographs, CT, MRI, and ultrasound were 3.41, 3.11, 2.75, and 3.14, respectively, consistent across academic years. Among OMS-III and IV participants, 7 completed a 2+ week Radiology rotation, with an average rating of 4.00 for identifying abnormal findings in CXR, compared to 3.07 for those without a radiology clerkship (p-value: 0.021), signifying a significant difference. Notably, students highly valued skills like distinguishing normal vs. abnormal findings, interpreting CT scans and radiographs, and possessing comprehensive anatomy knowledge.

Conclusion:
Our study highlights the importance of radiology-related skills throughout the medical curriculum. Confidence levels in imaging remain consistent across academic years, suggesting the establishment of foundational knowledge in the pre-clinical curriculum. Notably, students with dedicated radiology rotations show increased confidence in discerning abnormal findings in CXR interpretations. The emphasis students place on imaging-related skills emphasizes the necessity for a strengthened focus on medical imaging during the pre-clinical phase. The study advocates for expanded clerkships, workshops, and interactive learning to better equip future physicians with essential radiology skills before entering a clinical setting.

Analysis of Pre- and Post-COVID 19 Pandemic Pediatric Vaccination Rates in Arizona

Una Hadziahmetovic OMS-IV[1,2], Lawrence Sands DO MPH[1,2], Tiffany F. Hughes PhD MPH MBA[1]
1 College of Graduate Studies, Midwestern University
2 Arizona College of Osteopathic Medicine, Midwestern University

Objectives: Evaluate childhood vaccination rates in Maricopa and Yavapai counties and compare the rates pre-COVID-19 pandemic (2019-2020) to during (2020-2022) and after the pandemic (2022-2023). We hypothesize that childhood vaccination rates have declined since 2019 in both counties with a more pronounced decrease in Yavapai county.

Background: Currently, there are over 15 vaccines that are recommended by the CDC for children before the age of 18.[1] However, since the COVID-19 pandemic, childhood vaccination rates have decreased worldwide as health systems shifted their focus from routine vaccinations to rapidly distributing the COVID-19 vaccines as part of the pandemic response.[2,3]

Methods: The data was collected from the Arizona Immunization Coverage Levels Annual Immunization Data Report on the Arizona Department of Health Services website for Maricopa and Yavapai counties between 2019-2023 for three age groups: childcare, kindergarten, and 6th grade. A descriptive statistical analysis including determination of mean rates and time trends was performed.

Results: The rates for childhood vaccinations in both Maricopa and Yavapai counties decreased in all age groups between 2019 and 2023 with Yavapai County experiencing the largest overall decline of 3.97% compared to 2.11% in Maricopa County. In Yavapai County, the lowest decline occurred in 6th grade children (2.68%) and the highest decline in kindergarten age children (6.46%). In Maricopa County, the lowest decline occurred in childcare age children (1.29%) and the highest decline occurred in kindergarten age children (2.86%).

Conclusion: Overall, Arizona has seen a decrease in vaccination rates in Maricopa and Yavapai counties since the COVID-19 pandemic. Yavapai County had a larger decline than Maricopa County between 2019-2023 with the biggest decline in the kindergarten age group.

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Hypoxia-inducible factor 2-alpha (HIF-2α) is critical to cochlear development

Halen Heussner[1,2], Jared S Rosenblum[1,3], Yasemin Cole[4], Shuran Chen[4], Yijun Su[5], Iris Indig[4], Herui Wang[4], Russell H Knutsen[6], Danielle Donahue[7], Pamela Robey[8], Alexander Vortmeyer[9], Harshad Vishwasrao[5], Zhengping Zhuang[4], Karel Pacak[1]

[1]Section on Medical Neuroendocrinology, *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, MD 20892, USA; [2]Arizona College of Osteopathic Medicine, Midwestern University, Glendale, AZ 85308, USA; [3]Neurosimplicity, LLC, Shrewsbury, NJ 07702, USA; [4]Neuro-Oncology Branch, National Cancer Institute, National Institutes of Health, Bethesda, MD 20892, USA; [5]National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health, Bethesda, MD 20892, USA; [6]Laboratory of Vascular and Matrix Genetics, National Heart Lung and Blood Institute, National Institutes of Health, Bethesda, MD 20892, USA; [7]Mouse Imaging Facility, National Institute of Neurological Disorders and Stroke, National Institutes of Health, Bethesda, MD 20892, USA; [8]Skeletal Biology Section, National Institute of Dental and Craniofacial Research, National Institutes of Health, Department of Health and Human Services, Bethesda, MD 20892, USA; [9]Department of Pathology and Laboratory Medicine, Indiana University School of Medicine, Indianapolis, IN, USA

Introduction/Background

Von Hippel Lindau (VHL) syndrome patients develop endolymphatic sac (ELS) tumors leading to hearing loss without early detection and treatment. We recently discovered another neoplastic syndrome, Pacak-Zhuang Syndrome (PZS), related to VHL syndrome by a common molecular pathogenesis of hypoxia signaling. We hypothesized PZS individuals would similarly have inner ear pathologies that increase risk of hearing loss.

Objectives

We evaluated individuals with PZS, caused by gain-of-function variants in HIF-2α, and a corresponding mouse model we developed for inner ear pathologies and related hearing loss.

Methods

We prospectively evaluated the inner ears of PZS patients (n=3) by high-resolution MRI and CT. We also evaluated the mouse model at sequential developmental stages—post-natal day 8 (P8) and 5-months-old (adult)—by whole-mount skeletal survey (P8, WT n=2 MUT n=2), histologic sectioning with hematoxylin-eosin and Masson trichrome stains (adult, WT n=2 MUT n=2), high-resolution *ex vivo* micro-CT following terminal vascular casting (adult, WT n=3 MUT n=3; P8, WT n=3 MUT n=3), and light-sheet fluorescence microscopy (LCFM) [adult, WT n=1 MUT n=1, P8, WT n=2 MUT n=1] to evaluate vasculature, cartilage, and neuronal structures of the inner ear.

Results/Summary

On CT, we found otic capsule hyper-density in all PZS patients (n=3) and a shortened cochlea in one patient. We also found contrast-enhancing lesions of the ELS, which was subtly expanded (n=2). Micro-CT revealed otic capsule hyper-density and contrast-enhancing lesions near the ELS in all mutant mice (adult, n=3; P8, n=3), findings absent in the control. Histology confirmed abnormal otic capsule development and displayed abnormal morphology of the Organ of Corti (n=2). Whole-mount skeletal survey revealed abnormal ossification of otic capsule derivatives (P8, MUT n = 2 M, 1 F). LCFM showed vascular malformations at the cochlear nerve head involving abnormal accumulation of neural crest-derived mural endothelial cells.

Conclusion

These findings define a previously unrecognized pathology—vascular malformations of the inner ear—and reveal their association with improper development of the otic capsule. Further, we demonstrate that gain-of-function variants in HIF-2α are sufficient to cause these malformations. Thus, we suggest auditory evaluation for PZS patients to maximize early detection and treatability of inner ear pathologies.

Title: Assessment of COVID-19's Impact on Research Publications by Successful Orthopedic Residency Applicants

Authors: Elliot Jensen OMSIV, Alexandria McGuire OMSIII, and John Ashurst DO, DEd, MS for the MWU MIRAGE research lab

Affiliation: Arizona College of Osteopathic Medicine, Department of Assessment

Background: The NRMP's 2023 release of their biannual Main Residency Match data analytics most recently showed a total of 1,425 orthopedic surgery applicants competing for 899 residency spots, equating to a 63% match rate. This disproportionality between applicants and available residency positions, along with the specialty's heavy emphasize on performing orthopedic research requires prospective applicants to perform a large amount of research to remain competitive but data has shown that research productivity may have been limited secondary to the pandemic.

Objective: To determine if the COVID-19 pandemic had an impact on the research productivity of successful orthopedic surgery applicants.

Methods: A retrospective cohort of all orthopedic residents with graduation dates of 2024, 2026, and 2028 who authored publications before January 1st of their matriculation year were included in final analysis. Data abstracted included total number of publications, authorship location on each manuscript, resident demographics, relatedness to orthopedics, and type of article. Only US MD and DO graduates were included in the final analysis. A spearman's correlation was used to determine if there were any trends in publication patterns. Statistical significance was defined as $P \leq 0.05$.

Results: A total of 2517 orthopedic residents with 8270 publications were reviewed. The median number of publications of matched orthopedic surgery residents significantly increased across application cycles ($R = 0.19$, $p<0.0001$). The median number of publications by allopathic ($R = 0.19$, $p<0.0001$), osteopathic ($R = 0.20$, $p = 0.0001$), female ($R = 0.21$, $p <0.0001$), and male ($R = 0.18$, $p<0.0001$) orthopedic surgery residents increased over time. The median number of orthopedic residents who served as either first ($R = 0.16$, $p<0.0001$) or second author ($R = 0.13$, $p<0.0001$) on a publication has also increased over application cycles. The number of orthopedic articles ($R = 0.19$, $p<0.0001$) and review articles ($R = 0.15$, $p<0.0001$) published by each trainee increased over time.

Conclusion: Despite the COVID-19 pandemic, the number of publications produced by successful orthopedic applicants has increased over time. Further research should be conducted to determine if any differences exist across institutional and resident demographics.

AOMA 2024 Abstract – Research Poster Category

Title: ***Trends in Dermatological Research: Review of NIH Funding Between 2020-2023***

Authors: Henry Jeon, OMS-III; Jamie Stewart, OMS-II; Daniela Rizzo, OMS-II; Benjamin Mills, OMS-III; Alexandrea Doyle, OMS-II; John Ashurst, DO, DEd

Affiliations: Midwestern University Arizona College of Osteopathic Medicine

Objective
This review evaluates NIH dermatology R01 grant funding allocation from 2020-2023 based on academic institution, disease topic, PI demographic information, and PI experience in research. Data was analyzed to determine trends and discrepancies in funding distribution and disease focus compared to the burden of dermatological diseases in the US.

Introduction
Grant funding drives innovation in medical research. The National Institutes of Health (NIH) is the largest public funder of biomedical research in the world, therefore, knowledge about funding trends is pivotal for dermatologists to recognize disparities in their research field. Previous research highlights the underrepresentation of women in dermatological research. Current literature fails to examine NIH funding distribution as it relates to the primary dermatological disease of interest and lacks currency in evaluating NIH funding based on PI demographics.

Methods
The NIH RePORTER advanced search tool was utilized to assess PI and project demographics for R01 dermatology projects from the 2020-2023 fiscal years. Disease categories were cross referenced with the 2019 Global Burden of Disease (GBD) data report. Descriptive statistics and two-tailed T tests were used to analyze the data.

Results
From 2020-2023, the NIH granted over $151 million USD to R01 dermatology projects, with 32.9% of total funding given to the top five funded institutions. Approximately 31% of dermatology grants were offered to female PIs and females comprise 52.2% of the dermatology workforce (reported by AAMC). Total funding difference between male and female PIs was not statistically significant ($p=0.5465$). The average publications for a female PI receiving an R01 grant was 5.80 and for a male PI was 14.16 ($p<0.0001$). MD and PhD PIs received approximately 15.1% and 43.5% of grants, respectively, while MD/PhD dual degree holders received 40.5% of grants. DOs did not receive any R01 dermatology grants from 2020-2023. The disease category awarded the most grants was cutaneous malignancies, aligning with its rank of 2nd under GBD.

Conclusion
Female and osteopathic physicians continue to be underrepresented in dermatologic research when compared to clinical practice. Further analysis of funding trends is necessary to evaluate the directionality of dermatology to minimize gaps in research and improve patient outcomes.

The impact of vascular dementia on one-carbon metabolism and gene expression in cortical brain tissue of elderly patients

Authors

Sanika M. Joshi[1,2], Abbey McKee[1,2], Sharadyn Ille[2], Kristina Buss[3], Thomas G Beach[4], Geidy E Serrano[4], and Nafisa M. Jadavji[1,2]

Affiliations

[1]College of Osteopathic Medicine, Midwestern University, Glendale, AZ

[2]Department of Biomedical Sciences, College of Dental Medicine, Midwestern University, Glendale, AZ

[3] Bioinformatics Core, Arizona State University, Tempe, AZ

[4] Banner Sun Health Research Institute Brain and Body Donation Program, Sun City, AZ

Introduction

Vascular dementia (VaD) is a form of dementia that is projected to double in prevalence within the next three decades, placing it at the forefront of health service priorities. One-carbon (1C) metabolism centers around folic acid and is a key metabolic network that integrates nutritional signals with biosynthesis, redox homeostasis, and epigenetics. Deficiencies in 1C metabolites, such as dietary deficiencies in folic acid or choline have been linked to cognitive impairment, including VaD in the elderly population. However, the understanding of the role of 1C metabolism in VaD requires further investigation. Additionally, 1C metabolism plays an important role in epigenetics through gene expression through the generation of *S*-adenosylmethionine (SAM), a global methyl donor.

Objective

The aim of this study was to investigate the levels of 1C enzymes and receptors, as well as changes in spatial transcriptomics within post-mortem brain tissue from female and male patients diagnosed with VaD.

Methods

Post-mortem cerebral cortex tissue from male and female VaD-diagnosed patients and healthy controls was obtained from the Banner Sun Health Research Institute Brain and Body Donation Program. Immunofluorescence staining was performed to visualize the following 1C enzymes methylenetetrahydrofolate reductase (MTHFR), serine hydroxymethyltransferase (SHMT), thymidylate synthase (TS), choline acetyltransferase (ChAT), and acetylcholine esterase (AchE), cystathionine beta synthase (CBS) and the folic acid receptor (FR). All tissue was stained with a neuronal marker, NeuN, to ensure that the staining is specific to neurons, as well as DAPI. Co-localization of the staining was quantified using microscopy imaging by two individuals blinded to groups. Spatial transcriptomics analysis was performed on slides mounted cortical brain tissue using 10X Genomics Visium platform.

Results

In VaD cerebral brain tissue, there are no changes in choline metabolism. However, there are increased levels of MTHFR and CBS in female VaD patients compared to controls. Spatial transcriptomics analysis within cortical tissue revealed increased expression of glial fibrillary

associated protein (GFAP) and myelin-based protein (MBP) in VaD patients compared to healthy controls. Additionally, in cortical tissue there was reduced expression of GFAP and MBP in males compared to females.

Discussion

VaD is a complex disease; the results of this study demonstrate the impact of VaD on 1C and changes in gene expression. Supplementation with 1C in VaD patients may be beneficial for VaD affected patients as well as targeting reduced gene expression.

Funding: SMJ was funded by the Kenneth Saurez Research Fellowship

AOMA Abstract

Assessment of the Surgical Learning Curve for Operative Management of Adolescent Idiopathic Scoliosis by Procedure Type: A Systematic Review and Meta-Analysis

Nazanin Kermanshahi, BS[1]; Anthony N. Baumann, DPT[2]; Mathias Uhler[3]; Albert T. Anastasio, MD[4]; Kempland C. Walley, MD[5]; Davin C. Gong, MD[5]; Keith D. Baldwin, MD, MPH, MSPT[6]

Institutions
[1]College of Osteopathic Medicine, Midwestern University, Glendale, AZ, USA
[2]College of Medicine, Northeast Ohio Medical University, Rootstown, OH, USA
[3]College of Biological Sciences, University of Akron, Akron, OH, USA
[4]Department of Orthopedic Surgery, Duke University, Durham, NC, USA
[5]Department of Orthopedic Surgery, University of Michigan/Michigan Medicine, Ann Arbor, MI, USA
[6]Department of Orthopedic Surgery, Children's Hospital of Philadelphia, Philadelphia, PA, USA

Abstract

Objective
This systematic review and meta-analysis aim to examine the impact of the learning curve for the operative management of AIS via three different procedures to improve surgeon decision-making.

Background
Adolescent idiopathic scoliosis (AIS) is a common pediatric deformity that can be managed via various surgical procedures, including posterior spinal fusion (PSF), minimally invasive scoliosis surgery (MISS), and vertebral body tethering (VBT).

Methods
This study searched PubMed, CINAHL, MEDLINE, and Web of Science from database inception until July 31st, 2023. The inclusion criteria encompassed articles featuring AIS patients, assessment through the learning curve or experience, and full-text English content. Patients were classified into the learning phase group, or the final competency phase group based on surgeon experience or stage of surgeon learning.

Results
A total of 11 articles and 1,280 patients were included. For PSF, operative time (OT) and estimated blood loss (EBL) showed significant reduction. Differences in the complication rate and the number of fused levels were statistically insignificant. For MISS, OT, EBL, complication rate, number of fused levels, immediate postoperative improvement in Cobb angle, and length of stay (LOS) did not significantly change. For VBT, OT, EBL, and LOS significantly improved.

Conclusion
This study proposes the presence of a learning curve for the operative management of AIS by PSF and VBT demonstrated by significant improvement in the OT and EBT, with VBT also showing reduced hospital stay. However, MISS revealed no significant difference in EBL or OT between the learning and the competence phase. More research is needed to determine how the learning curve impacts surgeon education and patient care.

Improving Sleep with OMT: A Randomized Controlled Trial using Cranial and Cervical Techniques to Improve Sleep for First Year Medical Students

Dat Le OMS IV[1], December Fagen OMS-II[1], Spencer Christensen OMS-II[1], Richard Slife OMS-II[1], Amaya Alacron OMS-II[1], Chloe Jensen OMS-II[1], Chandini Thakur OMS-II[1], Ruthanne Teo OMS-II[1], Grace Spradley OMS-II[1], Stephanie Jackson OMS-II[1], Pegah Zamanian OMS-II[1], Darian Takase OMS-II[1], Nicholas Tran OMS-II[1], Albert Tran OMS-II[1], Kaitlyn Redeman OMS-II[1], Andrew Marble[1], James Keane DO, FACOI, FAC, Med[1], Melchiorra Mangiaracina DO, AOBNMM, AOBFP[1]

[1] A.T. Still University School of Osteopathic Medicine in Arizona

Objectives: (words 36)

1. Investigate whether OMT can enhance sleep quality in first year medical students.
2. Explore how cervical soft tissue, combined with OA decompression, influences the autonomic nervous system.
3. Utilize OMT as an effective solution for addressing sleep deprivation

Introduction: (words 40)

This study aims to evaluate the effect of OMT on sleep quality among medical students. Previous research has highlighted the influence of sleep on the academic performance of medical students. Hence, this study seeks to ultimately improve the well-being of medical students.

Methods: (words 74)

A 6-week study was conducted with 41 participants from ATSU-SOMA 2027; triweekly OMT sessions were administered. Participants were randomly assigned, half receiving cervical soft tissue and OA decompression, while the other half served as controls. One treatment and three control members dropped out. Weekly assessments were conducted using the Pittsburgh Sleep Quality Index. The responses were anonymized and converted to scaled scores ranging from 0 to 3, where higher scores indicated greater sleep disturbances.

Results: (words 105)

Both treatment and control groups showed a significant reduction in overall PSQI scores from week 0 to week 6. Although the treatment group exhibited a more pronounced decrease in PSQI score, statistical analysis using Mann-Whitney U tests did not yield significant results ($p = 0.234$). Stratifying participants based on their Body Mass Index (BMI), individuals with a BMI < 25 demonstrated a significant response to

OMT, with a marked decrease in PSQI score ($p = 0.016$), using a Bonferroni adjusted alpha of 0.017 to control for type I error. In contrast, participants with a BMI > 25 did not experience the same effect ($p = 0.857$).

Conclusion: (words 93)

This study aimed to assess the impact of OMT on sleep quality among medical students, recognizing its significance for academic performance and success. A trend towards a more pronounced decline in PSQI score was observed in the treatment group. Stratifying participants based on BMI revealed a difference. Participants with a BMI < 25 demonstrated a significant response to OMT. A larger sample size is needed to further validate these findings. Overall, this study highlights the potential value of OMT as a therapy for enhancing sleep quality among medical students, thereby improving their overall well-being.

Title: The Assessment of Point-of-Care-Ultrasound (POCUS) in Residency: The Benefits of a Four Year Longitudinally Integrated Curriculum

Authors and Affiliations: Duc Q. Le, MA, OMS-III[1]; Megan Scarpulla, MA, OMS-IV[1]; Hubert Lam, OMS-III[1]; Julia Kern, MA, OMS-IV[1]; Spencer Vroegop, OMS-II[1]; Jordan Yaeger, OMS-II[1]; Charles Finch, DO[1]; Wayne Martini, MD[3]; Charlotte A. Bolch, PhD[4]; Layla Al-Nakkash, PhD[1,2*]

[1]Arizona College of Osteopathic Medicine, Midwestern University, 19555 N. 59th Avenue, Glendale, AZ. 85308. USA
[2]College of Graduate Studies, Midwestern University, 19555 N. 59th Avenue, Glendale, AZ. 85308. USA
[3] Mayo Clinic Arizona, Department of Emergency Medicine, 5777 E Mayo Blvd Phoenix, AZ 85054. USA
[4]Office of Research and Sponsored Programs, Midwestern University, 19555 N. 59th Avenue, Glendale, AZ. 85308. USA

Objectives: To determine the frequency of Point-of-Care-Ultrasound (POCUS) use by Midwestern University Arizona College of Osteopathic Medicine (MWU-AZCOM) graduates and assess how a 4-year longitudinal ultrasound curriculum may enhance ultrasound utilization and interpretation by AZCOM students during residency.

Introduction/Background: A growing number of medical schools are incorporating POCUS training into their curricula, but many programs currently only offer ultrasound education during the first two didactic years of medical school. In 2017, AZCOM introduced a longitudinal approach that integrates hands on POCUS learning experiences into all 4 years of medical school. There is a small body of published research supporting this educational model, but there is a lack of published research addressing how this model translates to changes in real-world clinical POCUS use.

Methods: An anonymous novel twelve-question survey was conducted using REDCap and distributed to MWU-AZCOM 2021 and 2022 graduates via email. Questions were aimed at assessing frequency of use, utilization of various imaging modalities, barriers/enablers to using POCUS, and confidence in performing scans/interpreting POCUS imaging. All 104 surveys returned were included in the study. Statistical software R version 4.0 was used to conduct statistical analyses.

Results: Of the 484 surveys distributed, 104 were completed (21.5% response rate). The top five modalities used by residents were procedures (89.9%), cardiac (88.8%), pulmonary (82.0%), FAST (73.0%), and vascular (71.9%). Respondents recognized POCUS as a beneficial diagnostic tool (97.8%) and reported enhancements in physical examination skills (58.4%) and professional growth (61.8%).

Facilitators for POCUS adoption included cost-effectiveness (82.0%), diagnostic differentiation (78.7%), and safety (79.8%). Barriers included a lack of trained faculty (27.9%), absence of necessary equipment (26.9%), and cost of equipment (22.1%). Participants demonstrated high confidence levels in performing (74.0%) and interpreting (76.0%) POCUS, with 43.3% believing that their POCUS training enhanced their attractiveness as residency candidates.

Conclusion: This study supports the positive impact of a four-year longitudinal POCUS curriculum on graduates' practice. It emphasizes the link between MWU-AZCOM's curriculum and real-world clinical needs. Addressing identified barriers and advancing hands-on training can further enhance POCUS understanding, ensuring future physicians are well-prepared to leverage its diagnostic potential across a wide array of medical specialties.

Title: Differences in Peer-Reviewed Publications Between Successfully Matched Allopathic and Osteopathic Orthopedic Residency Applicants

Authors: Alexandria McGuire OMSIV, Elliot Jensen OMSIV, Daniel Casanova OMSIV and John Ashurst DO, DEd, MS for the MWU MIRAGE research lab

Affiliation: Arizona College of Osteopathic Medicine, Department of Assessment

Background: The NRMP's 2022 charting outcomes in the match most recently showed a 56.3% (111/196) match rate for DO seniors vs a 65.8% (703/1068) match rate for MD seniors applying into orthopedic surgery. With the recent emphasis on research in orthopedic residency match it is possible the discrepancy in match rate between DO's and MD's may be partially explained by differences in research productivity. While the NRMP groups presentations, posters, and publications together, isolating peer reviewed publications allows a more direct comparison between DO and MD research opportunities during medical school.

Objective: To determine the number and difference in peer-reviewed publications authored by successfully matched osteopathic and allopathic applicants into orthopedic surgery residencies.

Methods: A retrospective cohort of all orthopedic residents with graduation dates of 2024, 2026, and 2028 who authored publications before January 1st of their matriculation year were included in final analysis. Data abstracted included total number of publications, authorship location on each manuscript, resident demographics, relatedness to orthopedics, and type of article. Only US MD and DO graduates were included in the final analysis. Mann-Whitney U test was used to determine if there were any differences between groups. Statistical significance was defined as $P \leq 0.05$.

Results: A total of 2491 orthopedic residents, of which 2140 are MD and 351 are DO, with 8070 publications were reviewed. The median number of publications of matched orthopedic surgery residents significantly differed between MD's and DO's (2 [4] vs 0 [1]; $p < 0.0001$). The median number of 1st author publications (0 [1] vs 0 [0]; $p < 0.0001$), 2nd author publications (0 [1] vs 0 [0]; $p < 0.0001$), publications with authorship other than 1st or 2nd (1 [2] vs 0 [0]; $p < 0.0001$) differed significantly between MD and DO trainees. Allopathic residents matched with significantly more articles (1 [4] vs 0 [1]: $p < 0.0001$) and reviews (0 [0] vs 0 [0]; $p < 0.0001$) than their osteopathic counterparts.

Conclusions: Among successful orthopedic applicants, allopathic applicants produce significantly more peer reviewed research publications than their osteopathic counterparts.

Title: A cross-sectional survey of family medicine residents' knowledge of evidence-based medicine as assessed by the Fresno Test of Evidence Based Medicine

Authors: Tara Mohanroy OMSII[1], Jennifer Riedel OMSII[1], Benjamin Ihms DO[2], Donald Morgan DO[3], Anthony Santarelli PhD[4], Diana Lalitsasivimol PhD[4], John Ashurst DO, DEd, MS[3]

Affiliation: [1]Arizona College of Osteopathic Medicine, [2]Department of Assessment; Mountain Vista Medical Center, Department of Graduate Medical Education, [3]Kingman Regional Medical Center, Department of Graduate Medical Education; [4]Kingman Regional Medical Center, Office of Research and Sponsored Funds,

Background: Evidence-based medicine (EBM) has been described as an integration of the best research with clinical experience and patient values within a healthcare setting. Although many hours are spent teaching EBM, physicians still lack the foundational knowledge on the tenets of EBM despite having a perceived high level of competence.

Objective: To determine baseline EBM knowledge in a group of Family Medicine (FM) residents.

Methods: A convenience sample of FM residents from Kingman Regional Medical Center and Mountain Vista Medical Center were enrolled to complete the Fresno Test of Evidence Based Medicine (FTEBM). The FTEBM is a 212-point EBM knowledge assessment designed for those in FM that assesses both theoretical and computational skills. Demographic results were assessed utilizing descriptive statistics. Total and individual performances were assessed based on postgraduate year, medical degree, sex, and additional educational degree attainment by either the two sample Mann-Whitney or the Kruskal-Wallis test.

Results: A total of 22 FM residents were enrolled in the study with the average age being 34.18 years. Most respondents self-reported holding a degree in osteopathic medicine (16/22), being male (17/22), holding an advanced degree (12/22), and having either an average or above average knowledge in EBM (15/22). The average score on the total FTEBM of was 66.73 (31.48%) with three residents scoring higher than a 50% on the FTEBM. When examining the breakdown of the FTEBM, a score of 58.91 (32.73%) on the theoretical and 7.82 (24.44%) on the computational questions was seen. No statistical difference in overall scores was seen between allopathic and osteopathic physicians (0.197), having a second advanced degree (0.391) males and females (0.906), or post-graduate year (0.073). Those who rated their overall EBM knowledge as either poor/below average scored lower than those who rated their knowledge as either average/above average (55 vs 67; p=0.048).

Conclusion: Despite the majority of FM residents studied having a self-perceived average or above average knowledge in the principles of EBM, objective knowledge as assessed by the FTEBM was relatively low. However, residents were able to distinguish between their level of EBM knowledge and score on the FTEBM.

Title: Is Magnetic Resonance Imaging Overutilized Among Patients Undergoing Total Knee Arthroplasty?

Authors: Lekya Mukkamala BS[1], Sabina L. Schaffer MA[1], Matthew G. Weber DO[2], Jeffrey M. Wilde MD[2], Adam S. Rosen DO[2]

Affiliations: [1] Shiley Center for Orthopaedic Research and Education at Scripps Clinic, La Jolla, CA [2] Scripps Clinic Department of Orthopaedic Surgery, La Jolla, CA

Objectives: It is hypothesized that many pre-consult MRIs are unnecessarily performed for patients who underwent a TKA.

Introduction/Background: With increasing healthcare costs, it is important to quantify the number of total knee arthroplasty (TKA) patients with MRIs that are not considered clinically necessary, a source of overutilization of healthcare resources.

Methods: Our institution's IRB-approved arthroplasty registry was used to identify 869 primary TKAs performed by one of 7 surgeons between February 2021 and January 2022. All TKAs were chart reviewed. We defined an unnecessary MRI as one that was done without a weight-bearing radiograph but subsequently found to have moderate to severe OA on weightbearing films after MRI or one that was done with recent radiographic evidence of moderate or severe knee OA based on a physician's interpretation of the films or the radiologist's report.

Results/Summary: Of 869 total knee arthroplasties, 177 (20.4%) presented with a pre-consultation MRI. One hundred twelve met our inclusion criteria. Of the 112 MRI scans, 18 (20.7%) were done without radiographic imaging, and **69 (79.3%)** MRI scans were completed after radiographically evident moderate to severe arthritis. Overall, 87 (10.0%) MRIs were deemed clinically unnecessary.

Conclusion: Referring physicians are overutilizing MRIs prior to consultation with an orthopaedic surgeon. Of the patients who had unnecessary MRIs based on the conditions stipulated in the methods section, $20,706 cost could be saved. Extrapolating that number to the scale of patients affected by arthritis each year and over the average number of years of management before surgical intervention is potentially a staggering amount of money, leading to potential harm and increased healthcare costs. Evidence-based guidelines must be put into place to optimize healthcare utilization.

Title

Apoptosis is increased in cortical neurons of female Marfan Syndrome mice

Authors

Manogna Nuthi[1], Alisha Harrison[1] Mary Eunice Barrameda[1], Tala Curry[1,2], Faizan Anwar[1], Theresa Currier Thomas[1,2], Mitra Esfandiarei[1,2], Nafisa M. Jadavji[1,2]

Affiliations

[1]Midwestern University, Glendale AZ

[2]University of Arizona, Phoenix, AZ, USA

Introduction

Marfan Syndrome (MFS) is an autosomal dominant genetic disorder that affects connective tissue throughout the body due to mutations in the *FBN1* gene. *FBN1* encodes the fibrillin-1 protein, a matrix glycoprotein responsible for the formation of structural support of elastin and collagen network via microfibrils, controlling the expression and activity of multiple signaling molecules such as transforming growth factor-beta and matrix metalloproteinases. Individuals with MFS display symptoms of vascular dysfunction in addition to impaired skeletal and visual function, but the mechanisms of this multi-system dysfunction are still under investigation. While connective tissue disorders are known to present vascular abnormalities via their involvement in endothelial homeostasis and extracellular matrix turnover, there is still a gap in our understanding of the impact of monogenic connective tissue aberrations on the brain.

Objective

This study aims to determine the impact of MFS on neurodegeneration, in cortical brain tissue of male and female MFS mice as compared to controls.

Methods

Mice with the *FBN1*$^{C1041G/+}$ mutation serve as a well-established MFS model that recapitulates the classic manifestations of aortic root aneurysm that is common in human MFS patients. Using this model, brain tissue was collected from 6 month-old female and male *FBN1*$^{C1041G/+}$ and wild-type mice (n = 4 to 6 per group), fixed in 4% paraformaldehyde (PFA) for 24 hours, cryosectioned at 20μM thickness and serially mounted onto slides. Sections were stained for either apoptosis (active caspase-3) and neuronal nuclei (NeuN) or DNA defragmentation (TUNEL) and all cellular nuclei (4',6-diamidino-2-phenylindole (DAPI). Stained cortical brain tissue was imaged using a Leica TCS SPE confocal microscope to create z-stacks. Two observers blinded to experimental

conditions completed cell count colocalization of active caspase-3 and NeuN and TUNEL analysis using ImageJ (NIH). Outcomes were analyzed using a two-way ANOVA.

Results

Data revealed increased levels of active caspase-3 in neurons within the sensory and motor cortical areas of female $MFS^{+/-}$ mice compared to sex- and age-matched controls. We confirmed increased levels of apoptosis in $MFS^{+/-}$ using TUNEL staining within the same brain areas.

Discussion

These results indicate a heightened susceptibility for neurodegeneration. Investigating neurodegeneration in brain tissue of an MFS mouse model system will provide understanding of the effects of Marfan Syndrome to inform specific clinical considerations.

Effect of Intermittent Continuous Glucose Monitoring on A1c and Percent Time in Range in Patients Over 65 with Type 2 Diabetes

Ryan Orlando[1], Nicholas Smith[1], Noelle Sahhar PA-C[1], Gwen Wodiuk DNP, FNP-C[1]
1 Arizona College of Osteopathic Medicine, Midwestern University | 19555 N 59th Ave, Glendale, AZ 85308

Background

Continuous glucose monitoring (CGM) devices are known to facilitate reduction in HbA1c and improved percent time in range (PTIR) for patients who use insulin to manage their type 1 or type 2 diabetes (T2D). Research substantiating the role of CGM for non-insulin treated T2D patients is more limited yet demonstrates similar improvements with continuous use. Barriers exist for non-insulin treated T2D patients to access and wear CGM devices continuously, as access is determined by insurance reimbursement. A goal of this study is to determine the impact of utilizing CGM devices in an intermittent manner as an educational tool on HbA1c and PTIR.

Methods

Subjects 65 years and older with uncontrolled T2D underwent 3 separate 10-day trials at 0, 6 and 12 months during which they wore a DEXCOM G6 Pro CGM. Subjects were blinded to their real-time blood glucose levels from the monitor. During each of the trials, subjects kept a detailed diary containing their food intake and physical activity. After each trial, subjects met with a health care provider to review their blood glucose report from the monitor in depth and compare it to their diary. Interventions were made then to medications and/or lifestyle based on the provider-patient discussion.

Results

20 subjects were enrolled and have completed the 0-month trial, 17 subjects have completed the 6-month trial and 5 subjects have completed the 12-month trial. To date, an average of 2.78 dietary interventions, 1.73 pharmacological interventions and 1.47 exercise interventions have been made per subject across all visits. Preliminary data demonstrates an average A1c reduction of 0.14% across all subjects. Among those whose A1c has decreased, their average decrease was 0.56%. PTIR has increased across all subjects by an average of 7%, and among those whose PTIR has increased, their increase has averaged 25%.

Conclusion

By implementing blinded, short-term use of CGM for patients with T2D as an intermittent educational tool, we are beginning to find improvements in critical diabetic outcome measures including HbA1c and PTIR. The in-depth food and activity diary has allowed for personalized

lifestyle and medication interventions that patients are motivated to make following each trial visit.

Title: Representation of Women and Osteopathic Physicians as Editors in Nine Surgical Subspecialties

Authors: John Peck OMSII, Dakota Marshall OMSII, Alexander Candal OMSII, McKay Wilding OMSII, Mitchell Rentschler OMSII, Mason Kyle OMSII, Zachary Rosson OMSII, Oren Saghian OMSII, Jared Logsdon OMSII, Kori Kelley OMSII, Ruthvik Gundala OMSII, Scott Farr OMSII, Muhammad Kashif OMSII, Kevin Vander Werff OMSII, Dhairya Shah OMSII, Brian Mayer OMSII and John Ashurst DO, DEd, MS for the MWU MIRAGE research lab

Affiliation: Department of Assessment, Arizona College of Osteopathic Medicine, Glendale, Arizona

Background: Over the last several decades, the number of female and osteopathic physicians who have chosen to practice a surgical subspecialty has increased. Previous literature, however, has shown that very few female and osteopathic physicians serve as an editor on high-ranking journals from a surgical subspecialty.

Objective: To determine the current representation of women and osteopathic physicians on the editorial boards of nine surgical subspecialties.

Methods: The editorial boards from five high-ranking journals based upon impact factor from anesthesia, neurosurgery, thoracic surgery, urology, otolaryngology, orthopedics, plastic surgery, ophthalmology, and vascular surgery were reviewed. Editorial board members were categorized divided into the following groups: Editor in Chief, Associate/assistant/Deputy Editor in Chief, Executive/Senior/Section Editors, Associate/assistant Editor, and Other Editors. Gender was assigned using images or pronouns on research databases or hospital-affiliated website. Medical degree was determined using a similar search strategy and all editorial board members without a medical degree were removed from final analysis. The total number of female and osteopathic physicians in each specialty was determined based upon the 2021 AAMC Physician Specialty Data Report. A binomial proportion test was used to compare the distribution of women and osteopathic physicians serving on editorial boards and the number of women (18.99%) and osteopathic physicians (4.70%) in practice within the surgical subspecialities reviewed.

Results: A total of 2695 editors were reviewed with 18.48% being female ($p=0.49$) and 0.57% ($p<0.0001$) being an osteopathic physician. Females consisted of 16.07% all editors in chief ($p=0.73$), 18.57% of all Associate/Assistant/Deputy editors in chief ($p=1$), 22.85% of all executive/section/senior editors ($p=0.05$), 26.04% of all assistant/associate editors ($p=0.001$), and 15.67% of all editors categorized as other ($p=0.004$). Osteopathic physicians consisted of 0% of all editors in chief ($p=0.11$), 0.71% of all Associate/Assistant/Deputy editors in chief ($p=0.02$), 0% of all executive/section/senior editors ($p<0.0001$), 0.27% of all assistant/associate editors ($p<0.0001$), and 0.76% of all editors categorized as other ($p<0.0001$).

Conclusion: Females are not under-represented on the editorial boards of the journals studied. However, osteopathic physicians represent only a minority of editorial board members and are under-represented as compared to the number of osteopathic physicians in practice.

Title: The real-world use of centruroides immune F(ab) 2 equine at a community hospital: A retrospective cohort study

Authors: Codey Pedersen DO[1], Tyson Dietrich PharmD[2], Derek Meeks DO[1], Anthony Santarelli PhD[3], Adam Dawson DO[1], and John Ashurst DO, DEd, MS[1]

Departments: [1]Department of Graduate Medical Education, [2]Department of Pharmacy, [3]Office of Research and Sponsored Funds, Kingman Regional Medical Center

Abstract

Background: A large number of scorpion envenomations occur annually with the majority resulting in only localized symptoms. For those with systemic symptoms, however, the use of centruroides immune F(ab) 2 equine antivenom has been shown to resolve symptoms within four hours of administration.

Objective: To describe the use and outcomes of those treated with centruroides immune F(ab) 2 equine at a community hospital.

Methods: A retrospective cohort of patients given centruroides immune F(ab) 2 equine from June 1st 2019 to September 28th, 2023 were included in the final analysis. Data collected included demographics, presenting signs and symptoms, treatment modalities, adverse events, and final dispositions.

Results: A total of 12 patients (six children and six adults) were treated with centruroides immune F(ab) 2 equine during the study period. The majority of envenomations occurred at a residential site (10/12) while indoors (7/12), and while awake (6/12). The most common locations for envenomation were the foot (3/12) or torso (3/12). At presentation, the majority of patients had tachycardia (7/12), rotary nystagmus (11/12), fasciculations (9/12), other neurological dysfunctions (8/12), agitation (7/12), and tremor (7/12). The majority of patients had a complete blood count (10/12) and comprehensive metabolic profile (10/12) obtained as part of their emergency department visit. A small number of patients received benzodiazepines or opiates as a treatment prior to treatment with antivenom. The majority of those patients (7/12) treated with antivenom received 3 vials (360 mg) of antivenom. One major adverse event was related to the administration of antivenom which was anaphylaxis (1/12). Two patients were admitted for further monitoring due to pain and rhabdomyolysis.

Conclusion: All patients who received centruroides immune F(ab) 2 equine at a community hospital had symptoms of neuro-muscular excitation upon presentation to the emergency department. The majority of those treated with antivenom had improvement in their symptoms within four hours of administration. Antivenom dosing, laboratory testing, and other treatment modalities were inconsistent amongst providers. Future protocols should be developed to limit this variability.

Title: A cross-sectional survey of family medicine residents' knowledge of evidence-based medicine as assessed by the Fresno Test of Evidence Based Medicine

Authors: Tara Mohanroy OMSII[1], Jennifer Riedel OMSII[1], Benjamin Ihms DO[2], Donald Morgan DO[3], Anthony Santarelli PhD[4], Diana Lalitsasivimol PhD[4], John Ashurst DO, DEd, MS[3]

Affiliation: [1]Arizona College of Osteopathic Medicine, [2]Department of Assessment; Mountain Vista Medical Center, Department of Graduate Medical Education, [3]Kingman Regional Medical Center, Department of Graduate Medical Education; [4]Kingman Regional Medical Center, Office of Research and Sponsored Funds,

Background: Evidence-based medicine (EBM) has been described as an integration of the best research with clinical experience and patient values within a healthcare setting. Although many hours are spent teaching EBM, physicians still lack the foundational knowledge on the tenets of EBM despite having a perceived high level of competence.

Objective: To determine baseline EBM knowledge in a group of Family Medicine (FM) residents.

Methods: A convenience sample of FM residents from Kingman Regional Medical Center and Mountain Vista Medical Center were enrolled to complete the Fresno Test of Evidence Based Medicine (FTEBM). The FTEBM is a 212-point EBM knowledge assessment designed for those in FM that assesses both theoretical and computational skills. Demographic results were assessed utilizing descriptive statistics. Total and individual performances were assessed based on postgraduate year, medical degree, sex, and additional educational degree attainment by either the two sample Mann-Whitney or the Kruskal-Wallis test.

Results: A total of 22 FM residents were enrolled in the study with the average age being 34.18 years. Most respondents self-reported holding a degree in osteopathic medicine (16/22), being male (17/22), holding an advanced degree (12/22), and having either an average or above average knowledge in EBM (15/22). The average score on the total FTEBM of was 66.73 (31.48%) with three residents scoring higher than a 50% on the FTEBM. When examining the breakdown of the FTEBM, a score of 58.91 (32.73%) on the theoretical and 7.82 (24.44%) on the computational questions was seen. No statistical difference in overall scores was seen between allopathic and osteopathic physicians (0.197), having a second advanced degree (0.391) males and females (0.906), or post-graduate year (0.073). Those who rated their overall EBM knowledge as either poor/below average scored lower than those who rated their knowledge as either average/above average (55 vs 67; p=0.048).

Conclusion: Despite the majority of FM residents studied having a self-perceived average or above average knowledge in the principles of EBM, objective knowledge as assessed by the FTEBM was relatively low. However, residents were able to distinguish between their level of EBM knowledge and score on the FTEBM.

Evaluation of Impact of Intermittent Continuous Glucose Monitoring on Distress in Patients Over 65 Years with Type 2 Diabetes

Nicholas Smith[1], Ryan Orlando[1], Noelle Sahhar PA-C[1], Gwen Wodiuk DNP, FNP-C[1]
[1]Arizona College of Osteopathic Medicine, Midwestern University, Glendale, AZ, 85308.

Background

While continuous glucose monitoring (CGM) devices are a successful tool for patients who use insulin to manage diabetes, the use of CGM devices by providers is still limited as its use is determined by insurance reimbursement. By providing real-time reports of patient's glucose levels, providers can tailor specific dietary and lifestyle interventions for better diabetic management. A goal of this study is to determine the impact of patient-provider conversations regarding the influence of diet and activity on glucose contribute to lower diabetes-related distress.

Methods

Subjects 65 or older with diabetes that met inclusion criteria completed 10-day trials wearing a DEXCOM CGM device at day-0, 6-months, and 12-months. During trials, subjects were advised to live normally and to maintain a diary tracking all food intake, fluid intake, and activity above baseline. Following the trial, diary data was evaluated against the CGM report. Individualized interventions were identified including pharmacological, dietary, or lifestyle modifications. Two tools, the PAID and DDS questionnaires, were utilized to determine diabetic distress. Outliers were identified by IQR method.

Results

Twenty subjects were enrolled, 16 subjects completed the 6-month trial and 3 subjects completed the 12-month trial. Preliminary data adjusted for outliers and attrition yield a modest decrease in total DDS score from day 0 to the start of the 6-month trial (n=14). Emotional, physical, and interpersonal distress showed no change from day 0 to 6-months. Subjects reported moderate or greater levels of initial regimen distress and show a significant decrease in regimen distress from day 0 to 6-months. There was a modest decrease in PAID severe distress score from day 0 to 6-months. The average amount of dietary interventions was 3.4 and 0.8 lifestyle interventions.

Conclusions

This study focused on understanding the blinded use of CGM with an in-depth review of food and activity with glucose readings. Preliminary data shows decreased reported stress in subjects, a trend we expect to continue to decrease as the remainder of subjects complete the study. Subjects provided personalized interventions report a significant reduction in regimen distress. We attribute this reduction to patients being provided with actionable modifications tailored to their current lifestyle.

Title: The Impact of Medicare Annual Wellness Visits on Geriatric Preventive Care Education Among Medical Students

Authors: Kathleen Wong OMSIV, Dylan Hampel OMSIII, Danielle Barnett-Trapp DO, and John Ashurst DO, DEd, MS

Affiliation: Arizona College of Osteopathic Medicine

Background: Medicare Annual Wellness Visits (AWVs) provide opportunities to prevent disease and injury in geriatric patients via preventative care services (PCS). Despite these benefits, patient completion of AWVs remains low nationwide. Currently, there is limited literature demonstrating medical student involvement and understanding of the importance of AWVs.

Objective: To determine if medical student involvement in Medicare AWVs under direct supervision by a board-certified Family (FM) physician increases students' self-assessed confidence in geriatric PCS domains.

Methods: A convenience sample of third- and fourth-year medical students who were rotating at the Midwestern University Multispecialty Clinic between May 2023 and January 2024 were included in analysis. After an initial demographic survey, students completed geriatric PCS self-assessed confidence pre-, mid-, and post-surveys on study days 0, 9/10, and 23/24, respectively. Each survey assessed confidence on a Likert scale of 1 to 5 in nine core geriatric PCS domains covered at AWVs. Students participated in a dedicated AWV clinic day weekly under direct supervision by a board-certified FM physician. Descriptive statistics were calculated to interpret demographic majorities and a repeated measure analysis of variance was used to compare scores across surveys for each PCS domain over time.

Results: Demographic analysis revealed an average student age of 27.16 years with a self-reported male (68.89%) predominance. Most students had prior healthcare employment (64.44%) but no prior FM rotations (66.67%), Internal Medicine rotations (53.33%), or Geriatric Medicine rotations (0%). AWV involvement demonstrated significant increases in all nine PCS domains, each with positive correlations over time. Average confidence improvements from pre- to post-survey were 1.31 ($p<0.001$) for medication reconciliation, 1.02 ($p<0.001$) for functional status assessment, 1.22 ($p<0.001$) for cognitive impairment screening, 1.20 ($p<0.001$) for depression screening, 1.44 ($p<0.001$) for United States Preventative Services Task Force immunization guidelines, , 1.35 ($p<0.001$) for United States Preventative Services Task Force cancer screening guidelines, 0.86 ($p<0.001$) for discussing advanced directives, and 1.34 ($p<0.001$) for developing and 1.34 ($p<0.001$) counseling patients on personalized prevention plans.

Conclusion: Self assessed confidence in the geriatric PCS domains significantly increased following a rotation with a FM physician who involved them in the AWVs.