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South Dakota medicine

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Solutions, Not Problems

Jason J. Kemnitz, EdD

I was in an interview for a higher-level administrator at the SSOM several years ago, where the candidate was asked "How do you deal with problems in your department?" The candidate responded, "I require everyone to bring a solution or don't come to me. Without a solution, it's just a complaint session." While the candidate used a colorful expletive for "complaint," and the main point was missed, I often think of this when I'm in meetings 10 years later. We all get stuck focusing on problems rather than finding solutions. It's easier to identify what's broken than to see what could work. This mindset keeps us stuck and lowers the morale of those around us. Adopting a solution-focused approach can turn challenges into opportunities and shape us into the kind of leaders our institutions and students need.

Let's be honest: it feels easier to point out what's wrong than to think of what could work. Noticing problems doesn't involve risk or accountability and can provide temporary emotional relief. We hesitate to suggest imperfect solutions because we worry about being wrong or facing criticism of our ideas. Brené Brown describes this self-protective behavior as armor; it includes our thoughts, emotions, and actions that shield us when we avoid vulnerability.[1] This defensiveness stops us from engaging in the problem solving we say we want. If we only highlight issues without suggesting solutions, we lack accountability, which doesn't help us move forward. Instead, it keeps us stuck in cycles of complaint, creating a culture where cynicism stifles progress.

Shifting to a solution-focused mindset doesn't mean ignoring problems; it means reframing them. Brown defines vulnerability as the emotion we feel in times of uncertainty, risk, and emotional exposure. Solution-oriented leadership involves stepping into discomfort instead of hiding behind complaints. Research supports this method. A recent meta-analysis on solution-focused brief therapy found significant positive outcomes in healthcare and mental health settings, showing its effectiveness in improving overall mental health and helping individuals reach their goals.[2] The evidence is clear: focusing on solutions, rather than fixating on problems, leads to measurable improvements.

How can we practice this mindset? First, set a standard for yourself, before discussing a problem, think of at least one solution, even if it's partial or imperfect. You can also try using language that builds up rather than tears down. It can be as simple as saying, "Here's what I suggest rather than "This will never work."

Second, acknowledge the problem briefly, then quickly shift to "What can we do?" Instead of saying, "This clinic workflow is inefficient," ask, "How might we streamline patient handoffs?" This simple change turns complaints into questions that invite action and allows you to focus on what you can control rather than what you can't.

Finally, try to begin with small steps instead of waiting for a comprehensive plan. If you're frustrated with how effective your teaching is, you don't have to overhaul everything. Identify one immediate action. Could you try a new bedside teaching technique this week? When facing a challenge, ask yourself: What worked in similar situations before? These past experiences are valuable sources of practical wisdom.

This approach matters not just for our own wellbeing but also for those we serve. Research on physician activation, feeling that one's work is effective and meaningful, shows that clinicians who maintain this sense of purpose experience less burnout. Their patients also report better care experiences.[3] When we tackle problems with solutions instead of complaints, we help foster that sense of activation and meaning. Collaborate by inviting others to build on your ideas. Brown's research highlights that effective problem-solving requires us to listen as passionately as we wish to be heard. Attempt to adopt a trial-and-error approach. Try solutions, learn from them, and adjust. The willingness to experiment, take small risks, learn quickly, and make changes separates organizations that innovate from those that remain stagnant.

Here's my challenge: the next time you face a frustrating problem, commit to suggesting at least one solution before voicing your complaint. It may feel uncomfortable initially,

your solution might not be perfect, and someone may even disagree. However, those who focus on solutions become invaluable leaders and team members. They are the ones others turn to in times of crisis, the ones who energize rather than drain their teams, and the ones who show students what it means to be a physician who doesn't just identify problems but actively works to fix them.

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President's Comments

"Tempora mutantur, et nos mutamur in illis"

Times Change, and we change with them" – Emperor Lothair I

Keith Hansen, MD
President, South Dakota State Medical Association

This saying has been attributed to Emperor Lothair I and describes the importance of adaptation to change. Lothair I was Emperor of the Carolingian Empire from 817-855 as well as King of Italy and Middle France. As we navigate this year, the SDSMA has embraced the spirit of adaptation. These changes represent our commitment to building an even stronger, more efficient organization to advocate for the physicians and patients of South Dakota.

One change is a new home for the SDSMA. Our new office is located at 1610 S Minnesota Avenue in Sioux Falls. The 3,870 square foot building offers a modern, recently renovated space for our staff and members alike. We officially moved in mid-February. The space has adequate office space for the staff, a boardroom, and extra offices for expansion.

I invite members to join us on Thursday, May 28, the evening prior to our Annual Leadership Conference, for an open house to introduce our new space. Not only is it a workspace, it offers a social and collaboration space for members. Stay tuned for invitations to roundtable breakfast discussions, Friday fun days in the summer and opportunities to use the shared space for networking events. Be sure to follow us on social media – LinkedIn and Facebook – to stay updated on activities and events.

To ensure our team can remain focused on our core mission, the SDSMA has partnered with NAI for property management services of the investment property at 2600 W 49th Street. By shifting property management duties, staff can dedicate their full energy to perform the work of the association and enhance programming for members.

Since welcoming Tammy Hatting as the new CEO in July, she has hit the ground running and has been very active with advocacy, membership recruitment, district visits, finding the new office space and much more. We also have recently welcomed Kayla Keeler as our new Membership & Executive Services Manager, who brings a fresh vision from her time at the medical school. As you know, Terry Marks retired at the end of last year after a remarkable 43-year career supporting patients, physicians and the practice of medicine in South Dakota and we wish her a happy retirement.

The new staff complement the dedicated work of Justin Ohleen, Elizabeth Reiss and Kira Gravatt. As we finalize our 2026 membership renewals, I encourage you to bring new voices into the fold. If you know a physician who isn't yet a member, invite them to join. Together, we can ensure the SDSMA remains a powerful voice for the practice of medicine in our state.

Shifting Trends in Early-Onset Colorectal Cancer in South Dakota: A Focus on Population Incidence Patterns

Tiffany P. Rosemond, DrPH; Sarah Quail; and Laura Gudgeon, MS

Abstract

Background: Early-onset colorectal cancer (EOCRC) is rising nationally, with South Dakota experiencing a reversal in historical trends. Traditionally, American Indian populations have had higher EOCRC rates attributed to healthcare access disparities and socioeconomic factors. Recent data now reveals that the White population exhibits higher EOCRC incidence in South Dakota.

Methods: We analyzed data from the South Dakota Cancer Registry (2007–2022) to calculate EOCRC incidence rates for American Indian and White populations. Incidence rate ratios (IRRs) and 95% confidence intervals (CIs) were computed. Behavioral risk factors and insurance coverage were also reviewed.

Results: The White population's EOCRC incidence rose to 9.6 per 100,000 in 2018-2022, surpassing the American Indian rate of 7.8 per 100,000 (IRR = 1.27, 95% CI: 1.10–1.45). From 2021 to 2022, insurance coverage improved for both American Indians (46.6% to 55.5%) and Whites (81.5% to 83.4%). However, lifestyle disparities persisted. In 2021, American Indians reported higher fruit but lower vegetable intake than Whites. In 2022, physical activity was lower among American Indians (63.3%) than Whites (77.8%). In 2022–2023, obesity prevalence was significantly higher among American Indians (50.2%) than Whites (34.7%). Binge and heavy drinking percentages were elevated among Whites (30.8% and 10.1%, respectively) compared to American Indians (20.0% and 5.4%). Commercial tobacco use was reported higher among American Indians (45.1%) when compared to Whites (27.0%).

Conclusion: This shift highlights the success of American Indian-focused interventions and underscores emerging challenges among the White population.

Introduction

Colorectal cancer (CRC) is increasingly diagnosed among individuals under age 50, referred to as early-onset colorectal cancer (EOCRC). Nationally, EOCRC incidence has risen steadily over the past two decades among young adults. In South Dakota, this concerning trend provides a window into how local populations are impacted differently by broader health challenges.

While American Indian populations in South Dakota have historically experienced higher EOCRC rates due to social drivers of health such as limited healthcare access, socioeconomic disadvantages, and higher exposure to behavioral risk factors, recent data shows a remarkable reversal. EOCRC incidence among the White population has now surpassed that of the American Indian population for the first time in over two decades. This transition holds critical implications for cancer prevention and public health planning.

South Dakota's rural and tribal communities face distinct challenges that shape EOCRC outcomes. Rurality and provider shortages impact the White population, while tribal communities contend with unique cultural and historical factors that influence healthcare engagement. Understanding these shifting dynamics requires the integration of epidemiological data with insights on behavioral and social drivers of health.

This report presents a comprehensive assessment of EOCRC incidence trends in South Dakota, utilizing cancer registry data alongside behavioral and healthcare access indicators to inform future interventions and improve cancer screening access and improved outcomes for all in the state.

Methods

A retrospective analysis was performed using data from the South Dakota Cancer Registry spanning from 2007 to 2022. EOCRC was defined as a diagnosis of colorectal cancer in

individuals under the age of 50 years. The analysis focused on American Indian and White populations, which accounted for the majority of EOCRC cases in South Dakota. Data for other racial and ethnic groups were excluded due to small case counts and data suppression protocols.

Crude incidence rates were calculated annually per 100,000 population using mid-year population estimates from the U.S. Census Bureau. The crude incidence rate was calculated using the formula:

$$\text{Crude incidence rate} = \frac{\text{Number of EOCRC cases}}{\text{Population at risk}} \times 100{,}000$$

Incidence rate ratios (IRRs) and 95% confidence intervals (CIs) were computed to compare annual EOCRC rates between American Indian and White populations. Linear regression models were utilized to assess trends in EOCRC incidence over time and to determine the statistical significance of temporal patterns.

To investigate behavioral risk factors potentially associated with EOCRC trends, secondary data from the South Dakota Behavioral Risk Factor Surveillance System (BRFSS) were reviewed to assess differences in modifiable behaviors, including physical activity, fruit and vegetable consumption, obesity, binge and heavy drinking, and commercial tobacco use. These data represent crude, self-reported percentages among adults aged 18-49 and without adjustment for age. For obesity, commercial tobacco use, binge drinking, and heavy drinking, the most recent available data (2022-2023) for adults aged 18-49 were used. Additionally, healthcare access indicators such as insurance coverage were obtained from the Small Area Health Insurance Estimates (SAHIE).

Results

Between 2007 and 2022, American Indians consistently had higher EOCRC incidence rates until 2017–2021, when a reversal emerged. By 2018–2022, the White population's incidence rose to 9.6 per 100,000, surpassing the American Indian rate of 7.8 per 100,000 (IRR = 1.27, 95% CI: 1.10–1.45). This increase among Whites reflects a sustained rise from 6.8 per 100,000 in 2007–2011 to 9.6 in 2018–2022, surpassing the American Indian rate, which also rose but at a slower pace—from 7.1 to 7.8 per 100,000 over the same period. These trends suggest the effectiveness of targeted interventions in American Indian communities and an emerging concern for the White population. Regression analysis confirmed a significant 41% increase in the crude incidence rate of EOCRC among Whites and a 9.9% increase among American Indians between 2007-2011 and 2018-2022 (Figure 1).

Risk Factor and Screening Differences

Recent socioeconomic and behavioral data reveal differences in outcomes between American Indian and White populations in South Dakota that may contribute to differences in EOCRC incidence. Between 2021 and 2022, insurance coverage improved among both groups—rising from 46.6% to 55.5% for American Indians and from 81.5% to 83.4% for Whites (Figure 2).

Despite these gains, notable differences persist in health-related behaviors. In 2021, 71.3% of American Indians and 50.2% of Whites reported consuming fruit at least once per day, while 81.3% of American Indians and 80.0% of Whites reported consuming vegetables at least once daily (Figure 3). Physical activity data from 2023 show that 57.7% of American Indians engaged in the recommended physical activity level of 150+ minutes per week, compared to 61.8%

Figure 1. Trends in early-onset colorectal cancer (EOCRC) incidence rates per 100,000 population among American Indian and White populations in South Dakota from 2007 to 2022. This figure shows a historical pattern of higher incidence among American Indians until 2017-2021, when White incidence rates exceeded American Indian rates.

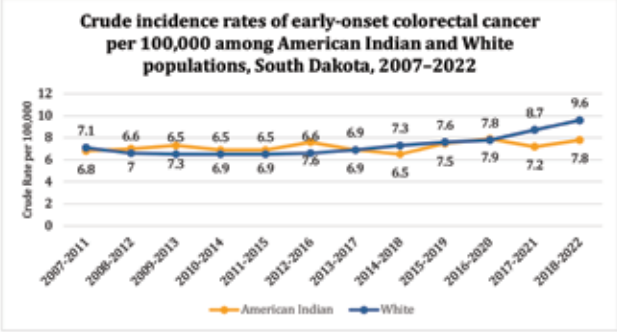


Figure 2. Health insurance coverage percentages among American Indian and White adults (aged 21–64) in South Dakota, 2021–2022. This figure shows an increase in coverage for both populations, with American Indian population coverage rising from 46.6% to 55.5%, and White population coverage increasing from 81.5% to 83.4%.

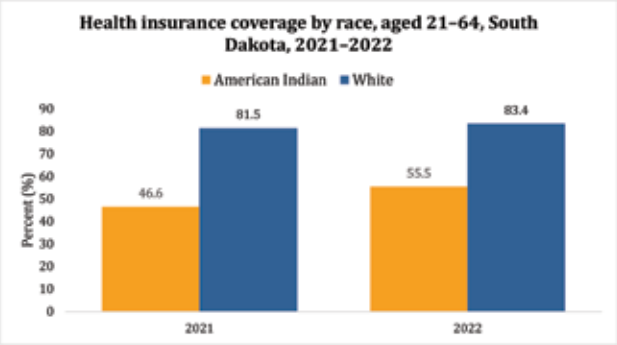


Figure 3. Crude percentages of daily fruit and vegetable consumption among American Indian and White adults aged 18 – 49 in South Dakota, 2021. This figure displays the percentage of adults reporting consumption of fruit and vegetables one or more times per day. American Indians reported higher fruit intake, while vegetable consumption was similar between groups.

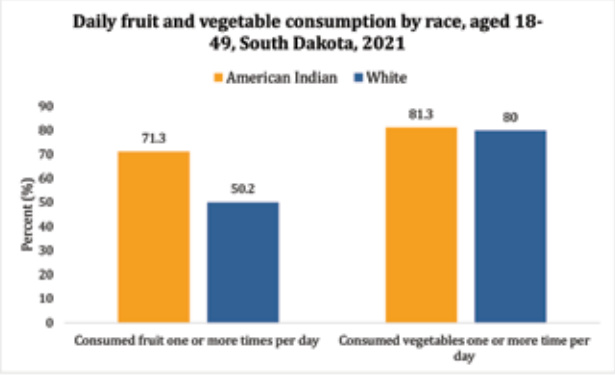


Figure 4. Crude percentages of American Indian and White adults aged 18-49 in South Dakota who reported engaging in the recommended physical activity level (150+ minutes per week) by CDC, 2023. This figure shows that 61.8% of White adults and 57.7% of American Indian adults reported engaging in the recommended physical activity level per week, based on self-reported BRFSS data.

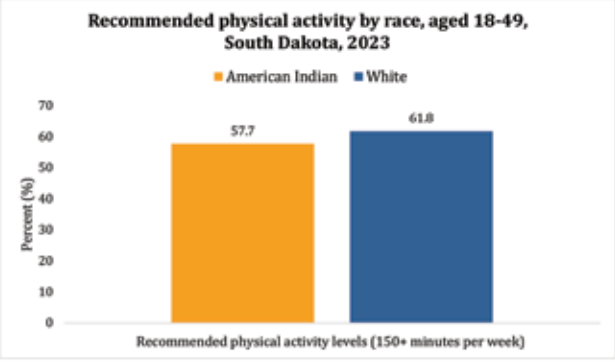
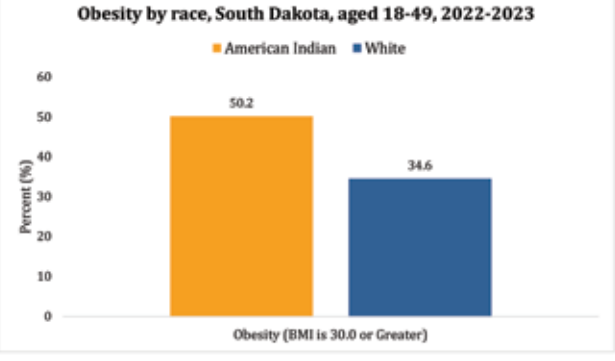


Figure 5. Crude percentages of American Indian and White adults aged 18–49 in South Dakota classified as obese (BMI ≥ 30.0), 2022–2023. This figure shows that 50.2% of American Indian adults and 34.6% of White adults aged 18–49 was classified as obese, based on self-reported BRFSS data from 2022–2023.



of Whites (Figure 4). These behavioral and access-related factors provide a critical context for interpreting the shifting EOCRC trends observed across racial groups in South Dakota.

Additional risk factor data from 2022–2023 further illustrate these disparities. Obesity prevalence among American Indian adults aged 18–49 was 50.2%, notably higher than the 34.6% observed among White adults in the same age group (Figure 5). Alcohol use patterns also varied: binge drinking was reported by 30.8% of White adults and 20.0% of American Indian adults, while heavy drinking was reported by 10.1% of Whites and 5.4% of American Indians (Figure 6). Commercial tobacco use was also markedly higher among American Indian adults aged 18–49 at 45.1% compared to White adults at 27.0% (Figure 7).

Discussion

The reversal in EOCRC trends underscores the importance of understanding how targeted interventions can reduce the cancer burden in historically underserved populations. Among American Indians, the slower rise in EOCRC incidence may reflect the impact of continued public health efforts, improved access to screening, and strengthened partnerships with tribal and urban Indian health departments.[1]

In recent years, tailored interventions and increased screening efforts in South Dakota have contributed to narrowing health gaps in CRC incidence. Research shows community-based initiatives, culturally appropriate education programs, and expanded access to screening services have improved early detection and facilitated timely intervention.[2] For example, some clinics use reminder cards and in-clinic stool testing. At the Fort Thompson Health Clinic, colon cancer screening signage is displayed in patient restrooms. Patients who choose on-site IFOB (Immunochemical Fecal Occult Blood) collection can provide samples directly to staff for immediate processing—strategies designed to improve completion rates of non-invasive screening tests. These low-barrier approaches offer convenience and privacy, encouraging participation among patients who might otherwise delay or avoid screening.

Moreover, clinical staff across several sites report consistently emphasizing the importance of early detection during patient visits, reinforcing the need for timely screening as a routine component of preventive care. These one-on-one discussions, while informal, represent a sustained and personalized strategy that aligns with broader public health messaging.

Figure 6. Crude percentages of American Indian and White adults aged 18–49 in South Dakota who reported binge drinking and heavy drinking, 2022–2023. This figure shows that 30.8% of White adults and 20.0% of American Indian adults reported binge drinking, while 10.1% of White adults and 5.4% of American Indian adults reported heavy drinking, based on self-reported BRFSS data from 2022–2023. Binge drinking is defined as consuming 5 or more drinks on one occasion for men or 4 or more drinks for women (in the past 30 days); heavy drinking is defined as more than 14 drinks per week for men or more than 7 drinks per week for women.

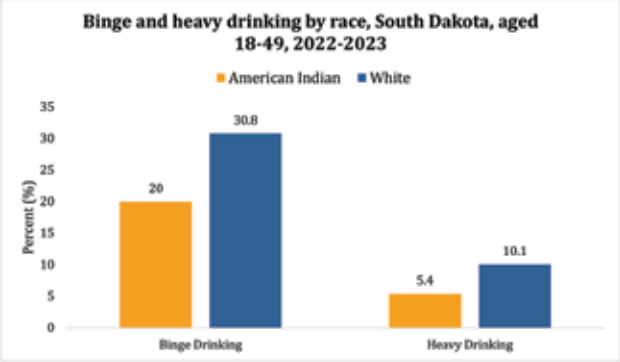
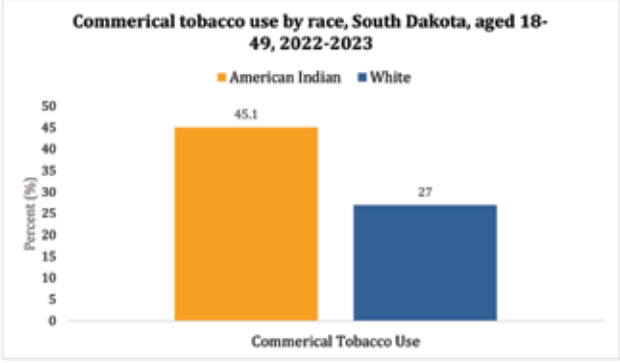


Figure 7. Crude percentages of American Indian and White adults aged 18–49 in South Dakota who reported commercial tobacco use, 2022–2023. This figure shows that 45.1% of American Indian adults and 27.0% of White adults aged 18–49 reported commercial tobacco use, based on self-reported BRFSS data from 2022–2023. Commercial tobacco use includes the use of e-cigarettes (vaping), cigarette smoking, and/or smokeless tobacco (chew).



Conversely, the rising trend among the White population may reflect persistent behavioral risk factors and social drivers of health in rural healthcare delivery. Many rural areas continue to face shortages of providers and long travel distances to screening sites.[3] Health beliefs and cultural norms in some communities may contribute to decisions on preventive services, including colorectal cancer screening.[4]

Recent behavioral data suggest that modifiable risk factors remain prevalent. Binge drinking and heavy drinking were both more common among White adults, with nearly one in three reporting binge drinking in the past 30 days. Commercial tobacco use was more common among American Indian adults aged 18–49 compared to White adults. These differences in modifiable risk factors may contribute to the observed reversal in EOCRC incidence rates.

In addition, modifiable lifestyle factors—such as low physical activity levels, diets lacking in fiber, and high intake of processed foods—are increasingly common.[5] Factors like limited access to safe spaces for physical activity and economic hardship may further increase these risks. As EOCRC incidence rises more rapidly among Whites, there is a growing need to implement tailored outreach and accessible screening options for rural and underserved non-tribal populations.

Study Limitations

This study is limited by its reliance on crude incidence rates, which do not account for age distribution differences between racial groups. BRFSS data provides valuable context but is self-reported and, therefore, subject to recall and reporting bias. The study does not account for hereditary cancer syndromes such as Lynch syndrome or familial adenomatous polyposis, which may contribute to a subset of EOCRC cases and represent an important non-modifiable risk factor.

Conclusion

The recent rise in EOCRC incidence among the White population in South Dakota represents a noteworthy shift in disease patterns, diverging from historical trends observed in the state. These findings underscore the importance of ongoing surveillance and flexible public health strategies that are responsive to the evolving needs of the population. Continued support for effective screening, prevention, and education efforts tailored to local and regional needs will be vital to addressing the EOCRC burden across all communities in South Dakota.

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Streptococcus Brain Abscess in a Healthy 30-Year-Old: A Case Report and Brief Review of Non-Neoplastic Mass-like Brain Lesions

Denzle Brayden Jensen, MD; Kennedy Forest, MD; Andrew Holmes, MD; Tamera Sturm, DO; and Megan Albertson, MD

Abstract

The reported case surrounds a previously healthy 30-year-old male who initially presented to primary care with acute vision changes. Further workup and imaging revealed an occipital mass lesion which appeared to enlarge after initiation of steroids. Debridement and specimen collection for culturing revealed an abscess growing *Streptococcus intermedius*. The consideration of a broad differential diagnosis for both neoplastic and non-neoplastic causes of tumor-like brain lesions is a critical component in accurate diagnosis and management in these rare cases.

Introduction

Mass-like lesions in the brain encompass a broad differential diagnosis from neoplasms or infections to inflammatory or demyelinating processes. Initial imaging can guide the clinician to determine the appropriate next step, but consideration of the possible causes of mass-like brain lesions outside of neoplastic etiologies is vital to safely achieve an accurate diagnosis.[1] This case highlights a presentation with imaging initially concerning for neoplasm, but ultimately, a less common infectious etiology was revealed, demonstrating the importance of a comprehensive diagnostic approach.

Case Report

Patient is a 30-year-old male without significant past medical history who presented to his primary care provider with acute vision changes. He noticed dark waves in the left periphery and double vision that progressed to loss of vision in the periphery of his left eye over several days.

Given the symptoms, he went to the local optometrist who identified left inferior homonymous hemianopsia and recommended urgent medical evaluation. He denied a history of dental disease or recent dental procedures. He denied recent travel, recent trauma, or other neurologic symptoms such as headaches, dizziness, lightheadedness, sensory deficits, or weakness. He had no known autoimmune conditions or high-risk behavioral activities. Of note, there was a history of flood water in his basement approximately eight months prior to presentation, and he adopted several cats one month prior. The patient was afebrile and hemodynamically stable. Physical examination was unremarkable for any findings aside from visual deficits in the inferotemporal quadrant of his left eye. Laboratory analysis included a complete blood count (CBC), comprehensive metabolic panel (CMP), and C-reactive protein (CRP) that were unremarkable aside from a minimally elevated CRP of 2.0 mg/dL (normal <0.5mg/dL). Magnetic resonance imaging (MRI) brain with and without contrast was notable for a 1.8 x 1.3 cm focus of diffusion restriction in the right occipital lobe with adjacent edema and peripheral contrast enhancement, in addition to pachymeningeal enhancement (Figure 1). Given the findings and the patient's acute vision changes, he was referred to a higher level of care and started on IV steroids.

On admission to the hospital, he spiked a fever of 102.6 F but had no further changes in symptoms or development of neurological deficits. Infectious workup with chest X-ray, urinalysis, and comprehensive respiratory viral panels were negative. Computed tomography (CT) chest/abdomen/pelvis was negative for any suspicious findings of infectious or malignant process. Ophthalmology was consulted for formal evaluation and verified true left inferior homonymous hemianopsia. Echocardiogram was unremarkable aside from a patent foramen ovale. Given the patient's fever of unknown etiology and neuroimaging findings, infectious disease was consulted and obtained significant workup for bacterial, parasitic, and viral etiologies. Lumbar puncture was performed the day after admission with the cerebrospinal fluid notable for 1 RBC (cells/uL), 7 WBC (cells/uL), normal protein levels, and elevated glucose at 88 mg/dL. The meningitis panel was positive for *Haemophilus influenzae* which prompted initiation of ceftriaxone. Two days after admission, interval MRI brain without contrast revealed an increased

Figure 1. Contrast enhanced axial T1 image (left) shows a rim-enhancing lesion (black arrow) in the right occipital lobe with thin adjacent pachymeningeal enhancement (white arrows). Axial T2 image (right) demonstrates central hyperintense signal (black arrow), a thin irregular capsule (white arrow), and surrounding vasogenic edema (curved gray arrows).

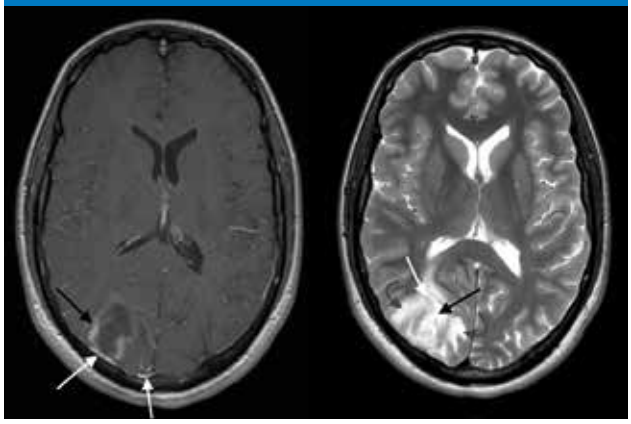


Figure 2A. Axial apparent diffusion coefficient (ADC) map (left) and diffusion weighted imaging (right) demonstrate low ADC signal (white arrow) and high DWI signal (black arrow) centrally in the lesion, indicating diffusion restriction of the non-enhancing component.

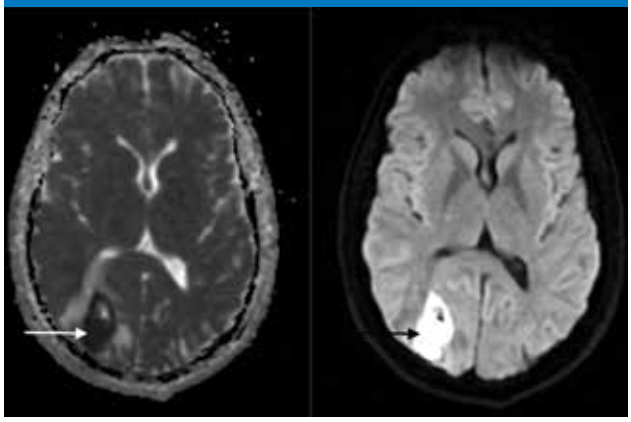
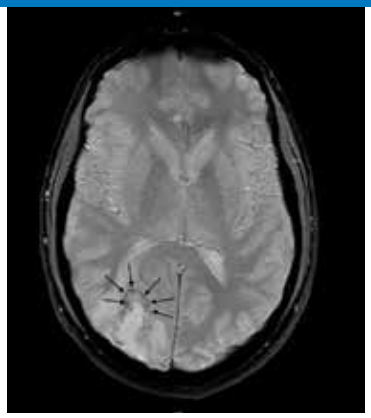
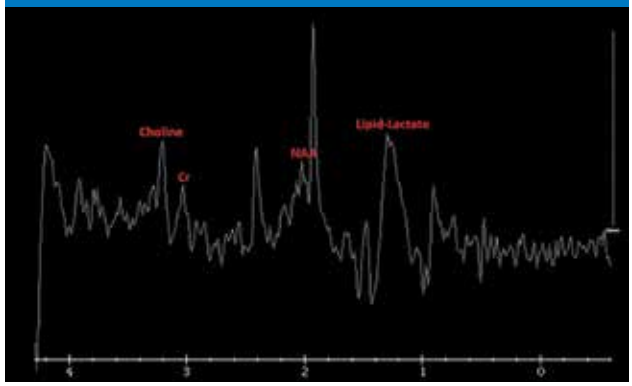


Figure 2B. Axial susceptibility weighted imaging (SWI) demonstrating stippled hypointensities (black arrows) in the capsule of the lesion.



size of the lesion with a central liquefied portion displaying diffusion restriction (Figure 2A) and the peripheral wall with stippled hypointensity (Figure 2B). MR spectroscopy revealed elevated lipid-lactate peak and depressed choline, creatine, and NAA peaks (Figure 3). Together, these neuroimaging findings were thought to be most compatible with a brain abscess.

Figure 3. MR spectroscopy demonstrates elevated lipid-lactate peak with depressed choline, creatinine (Cr), and N-acetylaspartate (NAA) peaks.

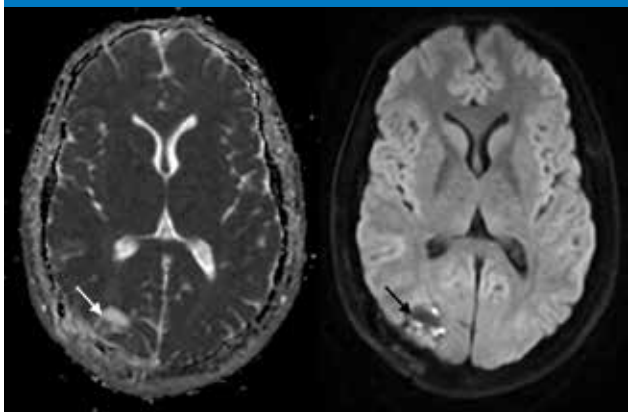


On the third day of hospitalization, right occipital craniotomy with abscess drainage and debridement was performed by neurosurgery. Intraoperative findings were notable for frank purulence exuding from the cortical presentation of the abscess. The patient was transferred to the neurocritical care unit afterward in stable condition and antibiotics were broadened to include vancomycin. Intraoperative Gram stain was notable for Gram-positive cocci and culture positive for *Streptococcus intermedius*. The patient was medically stable without any changes in neurological status aside from persistent left lower quadrantopia. He was discharged with home infusion ceftriaxone and oral linezolid with plans of close follow up with infectious disease, neurosurgery, ophthalmology, and his primary care physician. A follow up MRI brain with and without contrast was obtained 2 months later (Figure 4) demonstrating a smaller abscess cavity and post-craniotomy changes. The patient had persistent vision defects but was otherwise neurologically stable at that time.

Discussion

Although most mass lesions in the brain are primary or metastatic neoplasms, it is estimated up to 13% of patients with tumor-like brain lesions have non-neoplastic tumor mimics. As illustrated in this case, it is important to consider non-neoplastic etiologies of mass lesions in the brain as a delay in diagnoses can lead to increased morbidity and mortality.[1] "Tumefactive" or tumor-like lesions are identified on imaging

Figure 4. Post-operative axial ADC (left) and DWI (right) images show a relative lack of central diffusion restriction (white and black arrows, respective to ADC and DWI), consistent with treated abscess and expected post-craniotomy changes.



by their characteristic mass effect or having "positive volume effect" which can displace nearby structures. Additionally, masses often have superimposed volume displacement related to vasogenic edema from accumulated interstitial fluid, as seen in the reported case.[2]

While mass-like brain lesions cause a variety of symptoms depending on their anatomic location and underlying etiology, the most common presentation for all causes of mass lesions involves a focal neurological deficit or headaches.[3] Leukocyte counts and C-reactive protein are elevated in an estimated 60% of cases of brain abscesses, but these elevations could be a result of most diagnoses on the differential for mass lesions. Collection of blood cultures should be performed prior to antimicrobial initiation if infection is suspected. Additionally, investigation of causes of an immunocompromised state or infection exposure needs to be ruled out if there is concern for potential infection with abscess formation.[4]

There are unfortunately no laboratory tests that add more value than imaging in the workup of cranial mass lesions. Often times, CT imaging of the head is pursued initially in patients with focal neurologic deficits to address the concern for a stroke. Although mass lesions can be visualized on CT, MRI is the cornerstone of imaging brain lesions as it may reveal unique findings to help physicians make the correct initial steps in diagnosis and treatment. Despite these benefits, the MRI findings may often be nonspecific.[1] Ultimately, biopsy is the gold standard in confirmation of diagnosis of mass lesions in the brain.

The above workup with history, labs, and imaging can guide physicians to the most likely etiology of a mass-like lesion.

In addition to neoplastic causes, autoimmune conditions that affect the CNS may also manifest with tumor-like brain lesions, such as multiple sclerosis or neuromyelitis optica. Other less common conditions such as CNS vasculitis, myelin oligodendrocyte glycoprotein antibody-associated disease, and neurosarcoidosis have been reported to present as tumor-like lesions in unique cases.[1]

As in this case, brain abscesses also cause mass-like lesions on neuroimaging. Infections and abscess formations are typically a result of hematogenous spread, extracranial infections extending directly to the brain, infected emboli, penetrating head trauma, or post-neurosurgical complications. Risk factors that increase suspicion of abscess include a history of previous dental manipulation or recent sinusitis.[3] In immunocompromised patients, parasitic infections such as *Toxoplasma gondii* or *Trypanosoma cruzi*, fungal infections including *Cryptococcus, Aspergillus, or Histoplasma* species, viruses such as *Human Polyomavirus 2*, and bacterial infections including *Norcardia* species and *Mycobacterium tuberculosis*, have the potential to cause mass lesions on imaging.[6]

In the general population, the organisms most implicated in brain abscess formation are Staphylococcus aureus and Streptococcus species. Regarding the reported case, Streptococcus intermedius is a bacterial species typically identified in the oral cavity that belongs to the Streptococcus anginosus group (SAG). It has the potential to cause infections ranging from superficial periodontal disease and rhinosinusitis to life-threatening abscess of the liver, lung, or brain.[7] In this case, the "mass" lesion was ring-enhancing, which could prompt physicians to utilize the acronym "MAGIC DR L" when considering a differential diagnosis. This includes Metastasis, Abscess, Glioblastoma Multiforme, Infarct, Contusion (hemorrhage), Demyelination, Radiation necrosis, and Lymphoma. Using this acronym as a check list can help the physician better target their history and decide on a test-ordering algorithm.[8]

Conclusion

When imaging is ordered to work up a focal neurological deficit in a patient and a mass-like lesion is revealed, it is important for clinicians to consider several possible differential diagnoses to direct next steps in confirming the etiology. As observed in the reported case, brain abscesses can arise in patients without any known immunodeficiency or health history. Understanding the broad differential for neoplastic and non-neoplastic mass-like lesions can contribute to efficient and accurate diagnosis and therefore expedite appropriate treatment.

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The Linburg-Comstock Syndrome: A Case Report and Subject Review

Brant Hannahs, MS III; Chester Samuelson, MD; and Robert E. Van Demark, Jr., MD

Abstract

Linburg-Comstock syndrome (LCS) is a congenital anatomical variation characterized by an anomalous connection between the flexor pollicis longus (FPL) and flexor digitorum profundus (FDP) tendons. Though often asymptomatic, this anomaly can present with pain, cramping, and restricted hand movements, particularly during fine motor tasks. This literature review aims to review current knowledge regarding the anatomy, incidence, pathophysiology, clinical presentation, diagnostic modalities, and management strategies for LCS.

Introduction

Linburg-Comstock syndrome (LCS) is a congenital anatomical anomaly characterized by a connection between the flexor pollicis longus (FPL) and the flexor digitorum profundus (FDP) of the index finger.[1] First described in 1979 by Linburg and Comstock, this variant is often asymptomatic but can manifest with reduced dexterity or mechanical restriction when the thumb and index finger are used simultaneously.[2,3] This anatomical variant interferes with independent motor control, causing involuntary flexion of one digit when attempting to flex the other, ultimately restricting isolated flexion of these joints.[4] Although uncommon, patients may experience discomfort and swelling along the volar aspect of the hand and wrist, with potential development of tenosynovitis or secondary carpal tunnel syndrome.[5] Recognition of LCS is important for hand surgeons, occupational therapists, and musculoskeletal clinicians, particularly in patients with persistent hand pain or dysfunction without obvious pathology.

We report a case of a medical student at our institution with asymptomatic LCS which discusses the prevalence and the need for greater awareness among clinicians and trainees. This case report reviews the current literature on the prevalence, anatomical variations, clinical presentation, diagnostic strategies, and management of Linburg-Comstock syndrome.

Case Presentation

We had just finished seeing patients in the clinic. My medical student and I were discussing some of the cases we had seen that afternoon. My student asked me about his hand. He told me that whenever he tried to bend his thumb, his index finger would bend at the same time (Figure 1). He had no pain and no history of injury. I told him that he has a congenital condition called the Linburg-Comstock syndrome (LCS).

Anatomy and Pathophysiology

Linburg-Comstock syndrome arises from an anomalous connection between the FPL tendon to the thumb and the FDP tendon to the index finger. The FPL flexes the thumb interphalangeal joint (IP joint) and the flexor digitorum profundus tendon (FDP) flexes the index finger distal interphalangeal joint (DIP) joint. These tendons normally function independently, but the interconnecting slip in LCS interferes with isolated motor control. From a biomechanical perspective, the interconnection alters the usual independence of digital flexion, particularly during complex hand movements requiring fine motor coordination.

Figure 1. Thumb and index flexion in LCS.

In affected individuals, active flexion of the thumb's distal phalanx results in simultaneous, unintentional flexion of the index finger's DIP joint.[6] Most frequently, the tendinous slip arises proximally from the FPL and courses obliquely downward to insert into the FDP.[7] As a result, active flexion of the thumb leads to contraction of the FPL, but flexion of the index finger does not elicit concurrent flexion of the thumb.[7] This variation in hand anatomy is notable as the FPL tendon remains joined to the FDP tendons in non-humanoid primates.[8] The ability to flex the FPL and FDP independently of each other is a uniquely human trait, that provides incredible dexterity.[9] The anomalous connection most commonly originates from the muscle belly or distal tendon of the FPL and inserts into the FDP tendon to the index finger, although variations in the location, shape, and composition of the slip have been described.[6] Three distinct types of connections have been identified: tendinous, fibrous, and musculotendinous, with the musculotendinous variant being the rarest.[6]

During embryonic development, the FPL and FDP muscles arise from a common mesodermal precursor.[10] There are two main hypotheses to the development of LCS. The acquired hypothesis, though less commonly supported, suggests that the connection may develop secondary to trauma, inflammation, or repetitive use, leading to adhesions or anomalous connections between tendons.[11] However, no evidence of any prior trauma or overuse have been associated with LCS, suggesting a congenital etiology of LCS is more common.[12,13] The likely explanation for the development of LCS is most likely due to a failure of separation of the tendons from the common mesodermal precursor.

Incidence

Linburg–Comstock syndrome (LCS) is a relatively common anatomical variation of the hand, though reported prevalence rates vary significantly across studies due to differences in diagnostic criteria, population demographics, and methodology. A cadaveric study reported the presence of LCS in 25% of upper extremities.[2] In a separate study involving university students, the prevalence reached as high as 60%.[7] In another cohort of 500 individuals, LCS was identified in 213 participants, with the highest prevalence observed in Hispanics (57%), followed by Caucasians (50%), Asians (41%), and African Americans (31%).[1] A pooled prevalence estimate (PPE) is a statistical measure often used in **meta-analyses** to combine prevalence data from multiple studies into a single, overall estimate. A meta-analysis involving 13 studies on a total of 1680 individuals found a PPE of 21%, with a unilateral PPE of 11.8% and a bilateral PPE of 12%.[3] While one study found a higher prevalence in women compared to men,[14] other investigations have reported no significant sex-based differences.[15] Overall, LCS is a frequently encountered anatomic variation with variable expression across populations, often underrecognized unless symptomatic. Although typically asymptomatic, LCS may become clinically significant in individuals performing repetitive fine motor tasks, such as musicians, surgeons, and factory workers, potentially introducing a degree of occupational bias in reported prevalence among clinical populations.[16]

Clinical Presentation and Diagnosis

LCS typically presents with an inability to independently flex the thumb without simultaneous flexion of the index or middle finger. While most often asymptomatic and discovered incidentally, some individuals report discomfort, restricted range of motion, or mechanical interference during fine motor tasks such as writing, typing, or playing musical instruments.[2,5] Over time, or with repetitive stress, this aberrant connection may also contribute to mechanical strain, localized tenosynovitis, or secondary compression neuropathies such as carpal tunnel syndrome.[5] The diagnosis is primarily based on physical exam and is occasionally supplemented by imaging such as magnetic resonance imaging (MRI).[17]

A positive Linburg-Comstock test occurs when passive restriction of finger flexion during active thumb flexion toward the small finger elicits pain or cramping in the palmar or radial areas of the distal forearm or wrist.[2] (Figure 2) Alternatively, the patient may be asked to flex their thumb, with a positive result indicated by simultaneous index finger flexion.[11] (Fig. 3) While imaging is not usually necessary, MRI can be used to confirm the presence of LCS.[17] In select clinical scenarios, diagnostic imaging has been performed using which allows for real-time visualization of tendon movement and has proven valuable in confirming the presence of the anomalous intertendinous connection characteristic of LCS.[18,19]

Management Approaches

The management of LCS is largely guided by symptom severity and patient-specific functional impairment. Treatment options range from conservative management to surgical tenotomy for refractory cases.

Most individuals with LCS are asymptomatic and do not require treatment. However, for symptomatic cases,

particularly those involving pain, cramping, or restricted dexterity, treatment options range from conservative measures to surgical excision. Symptomatic patients can complain of pain in the distal forearm with thumb and index finger flexion. Management strategies that have been employed include nonsteroidal anti-inflammatory drugs (NSAIDs),splinting, therapeutic stretching exercises, and corticosteroid injections.[4] Although conservative treatment is tried initially, studies have shown that conservative measures for most symptomatic cases have been unsuccessful.[4,11,20] In cases where conservative management has failed, surgical excision of the anomalous tendon slip improves hand function and alleviates symptoms such as pain and cramping.[19,20] Consequently, surgical excision of the anomalous tendon slip remains the most reliable and definitive treatment option, with consistently favorable outcomes reported in the literature.[20]

Figure 2. Positive examination of LCS causing pain in the distal forearm (blue arrow).

Figure 3. Thumb flexion causing simultaneous index finger flexion.

Conclusion

Linburg–Comstock syndrome is a relatively common anatomical variant characterized by an anomalous connection between the FPL and the FDP tendons, which can result in involuntary coupling of thumb and index finger movements. Although the majority of cases are asymptomatic and discovered incidentally, a subset of individuals may experience pain, cramping, or impaired hand dexterity that warrants clinical evaluation and intervention. Diagnosis is primarily clinical, supported by physical examination maneuvers. However, dynamic imaging modalities such as high-resolution ultrasonography and MRI have emerged as valuable adjuncts, particularly in atypical or surgically complex cases. While conservative therapies are often attempted, their efficacy in symptomatic individuals appears limited. Surgical excision of the intertendinous slip remains the most effective treatment for those with persistent symptoms, offering excellent functional outcomes and a low rate of recurrence.

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Atypical Spitz Tumor in a Pediatric Patient: A Case Report and Review of the Literature

Joseph H. Kelly, MS IV; Linze M. Christensen, MS III; Stephanie R. Summers, MD; Amy M. Kerkvliet, MD; and Marcus L. Frohm, MD

Abstract

Spitzoid neoplasms are a collection of melanocytic lesions distinguished from conventional nevi or melanoma by a unique set of histological and molecular features. These Spitzoid proliferations – Spitz nevus, atypical Spitz tumor (AST), and Spitzoid melanoma – range from benign to malignant. Morphology alone has been an insufficient prognostic tool, but immunohistochemical stains prove useful for risk stratification. ASTs rarely metastasize beyond regional lymph nodes, and treatment includes wide local excision with or without sentinel lymph node biopsy depending on histomolecular features. Wide local excision of ASTs with negative margins is typically curative, with excellent long-term survival in pediatric cases. We present a case that highlights the importance of morphologic and molecular analysis to assess risk and guide management. Further research into molecular biomarkers may improve risk stratification and optimize treatment strategies for atypical Spitz tumors in pediatric patients.

Introduction

Spitzoid neoplasms are a heterogeneous group of melanocytic proliferations encompassing Spitz nevi, atypical Spitz tumors (AST), and malignant Spitzoid melanomas.[1] Spitz nevi are benign, while ASTs occupy a diagnostic gray zone displaying concerning histopathological features yet lacking sufficient criteria for melanoma.[2,3] These lesions are uncommon, accounting for about 1% of all melanocytic nevi, and typically present in the first three decades of life.[4,5] AST incidence in the United States is estimated to be about 1 per 200,000.[4,6] Incidence is rising, likely due to increasing recognition of their defining histological and molecular profiles.[2,4]

Classically, Spitz nevi present as a solitary, dome-shaped, pink-red papule with homogeneous pigmentation and well-demarcated borders. However, color can range from pink to black. Lesions typically measure a few millimeters to over a centimeter with an average diameter around 8 mm.[2-5] Spitzoid melanomas tend to be larger with more irregular features, such as asymmetry or ulceration, pigmentation, or recent growth.[3,5] Most lesions occur on the trunk, followed by extremities (lower > upper), then head and neck.[4] ASTs clinical presentation often falls somewhere in the middle (Figure 1).[2,4]

Given the varied clinical presentation, Spitzoid neoplasms produce a broad differential which may include melanoma, congenital melanocytic nevus, atypical nevus, blue nevus, hemangiomas, pyogenic granulomas, angiofibroma, and dermatofibroma; therefore, histopathologic evaluation

Figure 1. A) Clinical appearance of a benign Spitz nevus. B) Clinical appearance of an atypical Spitz tumor. C) Clinical appearance of a Spitzoid melanoma. Reproduced with permission from DermNet www.dermnetnz.org 2025.

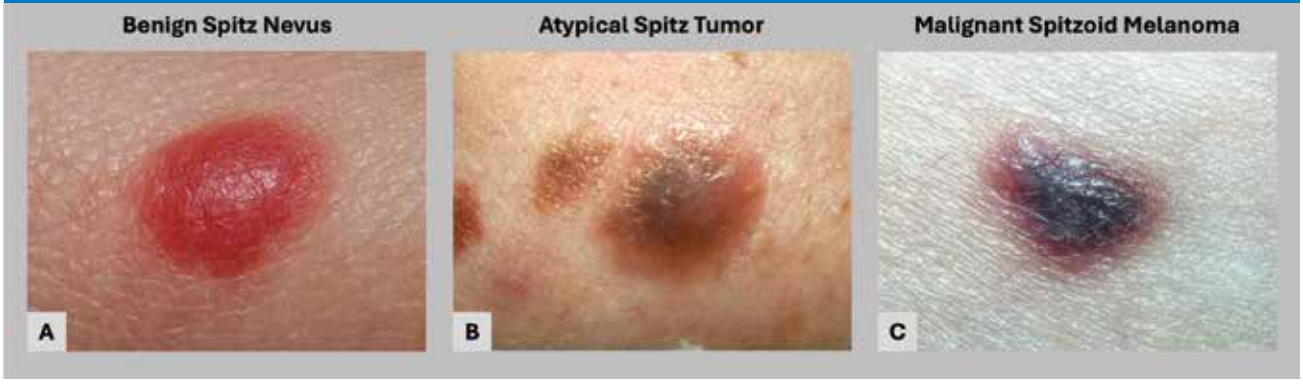


Figure 2. Clinical appearance of lesion at initial presentation. Solitary lesion on the left upper arm. Note red background color with asymmetric brown-black hyperpigmentation.

Figure 3. Clinical appearance of lesion five months after initial presentation. Remained a solitary lesion on the left upper arm. Note the diffuse hyperpigmentation now with crust.

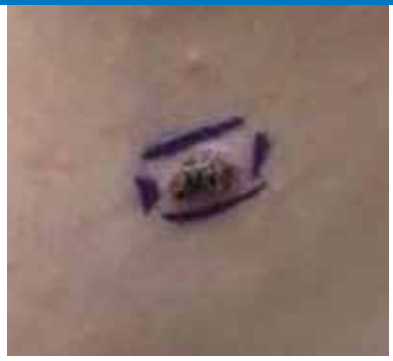
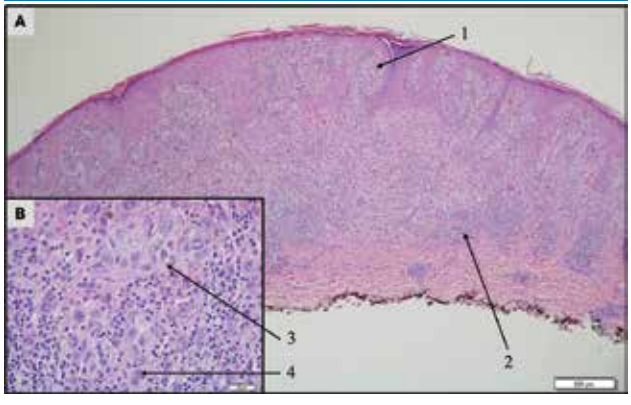


Figure 4. A) Hematoxylin and eosin stained section of the shave demonstrates an orthokeratotic hyperkeratotic epidermis with a central melanocytic proliferation (1) involving the dermoepidermal junction and superficial dermis. Band-like lymphohistiocytic inflammatory infiltrate (2) is present beneath the tumor at the base. *H&E, 40X*. B) Nests of irregular melanocytes (3) with irregular nuclear contours, abundant amphophilic cytoplasm, large hyperchromatic nuclei, and prominent nucleoli (4). *H&E, 400X*.



remains central to diagnosis.[2-5]

Histologically, all Spitzoid lesions often display large epithelioid or spindle-shaped melanocytes with abundant cytoplasm. Common findings include frequent mitoses and a wedge-shaped or vertically oriented growth pattern.[3,5] However, the limitations of diagnostic criteria to distinguish Spitz nevi from ASTs from Spitz melanoma, as well as interobserver variability, have been documented.[1,7]

This case highlights the diagnostic and prognostic uncertainty of atypical Spitz tumors. Clinical recognition of the full spectrum of Spitzoid neoplasms is critical for guiding proper histomolecular evaluation which enables accurate risk stratification that informs appropriate treatment.

Case Presentation

A 12-year-old Caucasian male with an unremarkable past medical history presented to his pediatrician for a well child check. Examination revealed a 5 x 4 mm elliptical, red papule with asymmetric brown-black discoloration on his left upper arm (Figure 2). His pediatrician made a non-urgent dermatology referral. When dermatology examined the patient 5 months later, the lesion had changed to an 11 x 6 mm elliptical, crusted, pink-black papule (Figure 3). The differential diagnosis was atypical spitz tumor versus malignant melanoma. Shave biopsy of the lesion was performed.

Histopathologic findings with hematoxylin and eosin staining were consistent with an atypical Spitz tumor (Figure 4). Immunohistochemical (IHC) staining was necessary to confirm a diagnosis and revealed low PReferentially expressed Antigen in MElanoma (PRAME) and BRAF V600E (BRAF) expression, strong p16 positivity, and negative ALK staining.

A follow-up exam two weeks later revealed a healing biopsy site with no signs of residual tumor or lymphadenopathy. A WLE with 5 mm margins was performed, with pathology confirming clear margins with no residual melanocytic proliferation. The patient was advised to follow up with a dermatologist every 6 months for 2-3 years and annually thereafter. Monthly self-examinations were encouraged.

Discussion

Melanocytic lesions of unknown significance are common reasons for dermatology referral. In pediatric patients, these are especially concerning, and accurate diagnosis is paramount, considering the potential to misdiagnose malignant melanoma, leading to unexpected fatalities.[8] This case highlights the diagnostic difficulty of Spitzoid

neoplasms. They often exhibit clinical and histopathological features that can be worrisome for malignant melanoma. Clinical features seen across the Spitzoid spectrum that are concerning for malignant behavior include larger size (>10 mm), asymmetrical borders, heterogeneous color, pigmentation, hemorrhagic crust, and evolution.[9,10] This ambiguity necessitates an array of histopathologic analyses and ancillary studies to pin an accurate diagnosis.

The integration of histopathological assessment with IHC profiling enhances the diagnostic accuracy of Spitzoid neoplasms. These lesions exist on a histopathologic continuum (Figure 5). Spitz nevi show classic benign features, and sufficient malignant criteria must be present to diagnose Spitzoid melanoma. ASTs exhibit a mix of benign and malignant histologic and molecular features. When a lesion cannot be confidently classified as a benign Spitz nevus, the workup to distinguish an AST from a Spitzoid melanoma begins. Common IHC markers include PRAME, BRAF, antigen Kiel 67 (Ki-67), and p16.[4,11-13] Negative expression of PRAME, BRAF, and Ki-67 paired with retained expression of p16 heavily favors an AST. The opposite expression pattern would favor melanoma.[4,12]

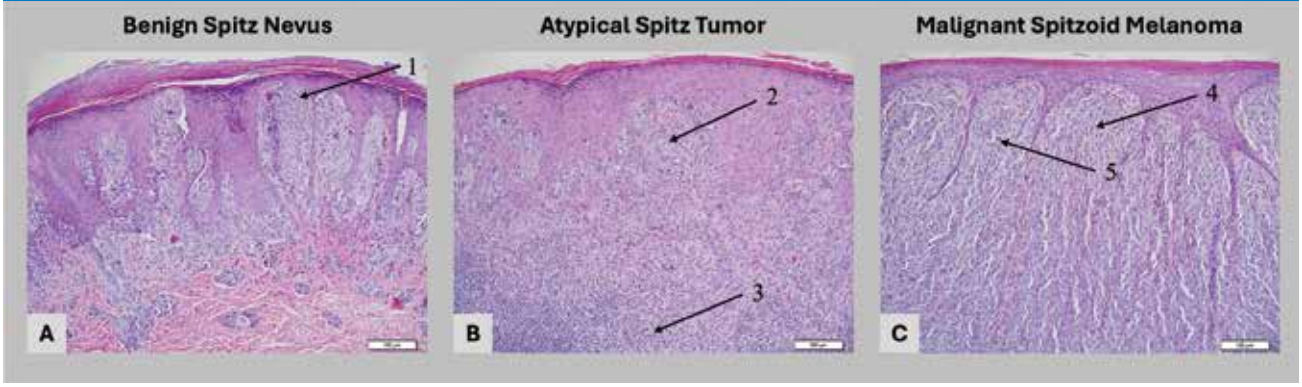
Genomic sequencing with comparative genomic hybridization (CGH) and fluorescence in situ hybridization (FISH) to analyze copy number gains and losses is of current interest for further classification and to help stratify risk. The Knudson hypothesis, or two-hit hypothesis, applicable to most cancers, appears to hold true for Spitzoid neoplasms. Various studies have drawn conclusions that certain gains or deletions are associated with benign or malignant behavior, though multiplicity of either pattern is concerning.[11,12,14,15] For example, homozygous 9p21 deletions, affecting the CDKN2A gene which encodes p16, have a higher likelihood of aggressive behavior.[12,14,15] This deletion often correlates with loss of p16 expression on IHC already discussed.[16]

Recent studies have also highlighted the role of kinase fusions in Spitzoid neoplasms. Fusions involving ALK, ROS1, NTRK1/2/3, BRAF, and RET have been documented.[14,17] These present the potential for therapeutic targeting and risk stratification. Benign and malignant associations have yet to be fully evaluated, though broad evidence strongly suggests more genetic aberrations correlate with poorer prognoses. Dermatopathology evaluation of the nuanced expression patterns and their correlation with morphological features is critical for accurate diagnosis and management.

Proper diagnosis and risk stratification are crucial for guiding clinical management. While Spitz nevi typically do not require therapy – though opinions differ on whether complete excision with clear margins is warranted for all Spitz nevi – any histomolecular features suggestive of malignant potential prompt WLE.[3-5] A recent report recommends WLE with 1 to 3 mm margins for ASTs favored to be benign with involved biopsy margins and WLE with 5 mm margins for ASTs with uncertain malignant potential. Sentinel lymph node biopsy was not recommended for Spitz neoplasms unless clinicopathologic evaluation favors a diagnosis of cutaneous melanoma.[18,19]

While the prognosis for ASTs is generally favorable, recurrence occurs in 5-15% of cases with incomplete excision. In rare cases, there is regional lymph node involvement, yet this micro-metastatic spread does not equate to poor outcomes.[2,5,19] An extremely small number of cases have progressed beyond the sentinel lymph nodes.[5] Therefore, long-term follow-up is always recommended.[2,5] Continued data collection and molecular profiling may help refine risk

Figure 5. A) Symmetric compound epithelioid melanocytic lesion (1), consistent with a Spitz Nevus. *H&E, 100X.* B) Nests of spindled to epithelioid melanocytes (2) involving the dermoepidermal junction, within a background of lymphohistiocytic inflammation (3). *H&E, 200X.* C) Asymmetric melanocytic proliferation within the dermis (4), with atypia and mitotic figures (5), consistent with a Spitzoid Melanoma. *H&E, 100X.*



stratification and follow-up protocols in the future.

Conclusion

Spitzoid neoplasms span a spectrum from benign to malignant lesions, often with overlapping clinical and histomolecular features. While Spitz nevi are benign and Spitzoid melanomas require treatment due to their malignant behavior, atypical Spitz tumors occupy a diagnostically challenging space. Despite their uncertain malignant potential, prognosis is generally excellent with accurate diagnosis and appropriate management. Achieving optimal outcomes with atypical Spitz tumors requires a multidisciplinary approach between clinician, dermatopathologist, and surgeon.

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Shifting Support in Surgical Oncology: A Retrospective Cohort Study of Companion Presence During Breast Reconstruction Consultations Before and During COVID-19

Kianna Thelen, MS IV; Molly Lien, MS IV; and Heather Karu, MD

Abstract

Background: Support persons are essential in cancer care, particularly during surgical consultations that involve complex decision-making and emotional stress. However, the COVID-19 pandemic introduced visitor restrictions that limited in-person companion access, raising concerns about patient-centered care. This study examined patterns of companion presence during breast reconstruction consultations in 2020 and compared findings to a pre-COVID cohort to assess shifting predictors of support-seeking behavior.

Methods: A retrospective review was conducted of all breast reconstruction consultations (N = 59) at a regional plastic surgery center during the first year of the COVID-19 pandemic. Demographics, cancer status, travel distance, and companion presence were extracted from electronic medical records. Companion types and behaviors were qualitatively assessed from provider notes. Results were compared to a previously published pre-COVID cohort (N = 421). Statistical analyses included chi-squared tests and independent samples t-tests ($\alpha = 0.05$).

Results: Despite pandemic restrictions, 51% of patients brought a companion. Companion presence was significantly associated with having an active cancer diagnosis (71.9% vs. 25.9%, p = .004), while marital status and travel distance were not significant predictors. In contrast, pre-COVID data showed marital status and travel burden as significant predictors of accompaniment. Provider notes revealed companions frequently offered emotional support, clarified medical details, and assisted in decision-making.

Conclusions: Support persons remained integral to breast cancer care during COVID-19, particularly for patients facing active disease. These findings underscore the importance of flexible institutional policies that preserve the patient-companion relationship during emotionally charged consultations.

Introduction

In breast cancer care, companions—often spouses, family members, or close friends—play a vital role in supporting patients through emotionally complex and medically significant decisions. These support persons not only offer emotional comfort but often assist with interpreting information, advocating for patient preferences, and helping to coordinate logistics such as travel, finances, or follow-up care. Prior research has shown that companion presence enhances patient understanding, satisfaction, and engagement in shared decision-making, especially in high-stakes consultations such as surgical planning.[1,2]

Surgical reconstruction following breast cancer represents one of the most emotionally and physically consequential decisions a patient may face. While physicians provide critical clinical insight, companions often serve as a bridge between technical information and lived experience, especially when patients are faced with uncertainty or fear. In routine practice, factors such as relationship status and travel burden have historically influenced whether a patient is accompanied to such appointments. For example, our previously published work found that married patients and those traveling longer distances were significantly more likely to bring a support person, underscoring the logistical and emotional function companions serve.[3]

However, during the COVID-19 pandemic, healthcare institutions across the country implemented strict visitor limitations to mitigate viral transmission risks. These restrictions disrupted the conventional role of support persons

in clinical encounters, raising ethical and practical concerns regarding patient autonomy, equity, and psychological well-being. Emerging studies during this time revealed that while some patients adapted to virtual participation by loved ones, others faced increased anxiety, isolation, and decisional conflict when navigating care alone.[4]

Moreover, the pandemic magnified existing disparities in access and support, particularly for vulnerable populations such as newly diagnosed cancer patients. Decision-making under these constraints becomes a test of relational autonomy—the concept that personal autonomy is often exercised in the context of trusted relationships rather than in isolation. For patients with complex or time-sensitive diagnoses, the absence of a support person may hinder both comprehension and comfort, potentially altering treatment choices or confidence in care.[5]

This study examines how companion presence during breast reconstruction consultations was affected by COVID-19 restrictions, with a specific focus on whether traditional predictors such as relationship status and travel distance continued to play a role. Additionally, we compare these pandemic-era findings to a pre-COVID cohort treated at the same institution. By evaluating shifts in support-seeking behavior, our goal is to understand how patients prioritize emotional and logistical support in constrained healthcare settings and to inform future policies that uphold patient-centered care—even in times of crisis.

Methods

Study Design and Setting

During 2020, Sanford Health limited clinic visitors to a single essential companion in select cases. For elective visits, companions were generally restricted unless exceptions were requested. These policies directly shaped patterns of accompaniment during consultations.

This retrospective cohort study evaluated companion presence during in-person breast reconstruction consultations conducted at a single regional plastic and reconstructive surgery clinic in Sioux Falls, South Dakota. The study focused on all new patient consultations that occurred between January 1 and December 31, 2020—a period that coincided with active COVID-19 restrictions on clinic visitors. This study was approved by the Institutional Review Board at Sanford Health (STUDY00002903) and all data were collected and analyzed following HIPAA compliance guidelines.

Patient Inclusion

Patients were eligible if they completed an in-person consultation with the clinic's board-certified plastic surgeon (telemedicine visits were excluded, as companion presence could not be reliably assessed). At the time of this study, all breast reconstruction consultations were conducted by a single board-certified plastic surgeon at the institution.

Data Collection

Chart review was conducted using the institution's electronic medical record (EMR) system. The EMR was reviewed by two independent abstractors (medical students), using a piloted abstraction form. Data were entered into REDCap, with 10% of entries double-checked for accuracy. Missing data were cross-verified with provider notes; if unresolved, the variable was coded as missing.

- Age (in years)
- Body mass index (BMI)
- Relationship status (married/partnered vs. single/divorced/widowed)
- Diagnosis type (active breast cancer vs. prophylactic)
- Travel distance from home to clinic (in miles; mean, SD, and range reported)
- Companion presence (yes/no)
- Companion relationship (spouse, child, parent, sibling, friend, or other)

Provider notes from the consultation encounter were also reviewed to assess qualitative details regarding companion participation (e.g., asking questions, emotional support, transportation assistance).

Outcome Measures

The primary outcome was the presence or absence of a companion during the breast reconstruction consultation. Secondary outcomes included the companion's relationship to the patient and whether companion presence was associated with patient demographics, cancer status, or travel distance.

Statistical Analysis

Descriptive statistics were calculated for all variables. Means and standard deviations were reported for continuous data (e.g., age, travel distance), and frequencies and percentages were reported for categorical data. Chi-squared tests were used to assess associations between categorical variables (e.g., companion presence vs. cancer status), while independent samples t-tests were used for comparisons involving

continuous variables. A p-value less than 0.05 was considered statistically significant. All analyses were performed using Python (v3.10) with SciPy and StatsModels libraries.

Results

Patient Characteristics

Patients traveled a mean distance of 65.3 miles (SD = 42.8; range: 3–210 miles)

Of the 59 patients, 32 (54.2%) had an active breast cancer diagnosis, while 27 (45.8%) were seeking prophylactic surgery due to elevated genetic or family risk. Despite COVID-19 visitor restrictions, 30 patients (50.8%) attended their consultation with a companion.

Companion Presence by Diagnosis

Patients with an active breast cancer diagnosis were significantly more likely to bring a companion than those undergoing prophylactic consultation (71.9% vs. 25.9%; χ^2 = 8.28, p = 0.004, ϕ = 0.38), indicating a medium-to-large effect size. Among the 32 patients with active disease, 23 brought a companion, while only 7 of 27 prophylactic patients did so.

Companion Presence by Marital Status and Distance

There was no statistically significant difference in companion presence based on relationship status (58.9% among married/partnered vs. 36.4% among non-partnered; χ^2 = 1.80, p = 0.18). Travel distance was also not significantly associated with companion presence (mean 68.1 miles for accompanied vs. 62.5 miles for unaccompanied patients; t(57) = 0.55, p = 0.58).

These findings contrast with the pre-COVID cohort (N = 421), where married patients were significantly more likely to bring a companion (83% vs. 56%, p < .001), and companion presence correlated with longer travel distances (105 vs. 77 miles, p = 0.057).

Types of Companions

Of the 30 patients who were accompanied, the majority of companions were spouses or romantic partners (n = 21; 70%). Other companion types included adult children (n = 3; 10%), siblings (n = 2; 6.7%), and friends (n = 4; 13.3%). No patients reported multiple companions due to institutional limits on visitors during the pandemic.

Comparison with Pre-COVID Cohort

A side-by-side comparison (Table 1) revealed that while the overall companion rate remained relatively stable (57% pre-COVID vs. 51% during COVID), the predictors of accompaniment shifted. Previously, marital status and travel distance were strong predictors of companion presence. During the pandemic, these factors lost significance, while cancer status emerged as the most consistent and significant variable.

Discussion

This study examined the presence of support persons during breast reconstruction consultations conducted amid the COVID-19 pandemic and compared findings to a pre-pandemic cohort. Our results demonstrate that even under restrictive institutional policies, over half of the patients in our COVID-era sample brought a companion to their consultation. Most notably, patients with an active breast cancer diagnosis were significantly more likely to be accompanied, while marital status and travel distance—previously strong predictors—were not significantly associated with accompaniment during this time.

These findings offer several insights into how patients prioritize support during critical decision-making, particularly under the pressures of a global health crisis. The stability in overall companion presence (51% during COVID vs. 57% pre-COVID) suggests that patients continued to seek

Table 1. A side-by-side comparison revealed that while the overall companion rate remained relatively stable (57% pre-COVID vs. 51% during COVID), the predictors of accompaniment shifted.

Variable	Pre-COVID (2015–2020, N = 421)	During COVID (2020, N = 59)	Interpretation
Companion rate	57%	51%	Slight decline despite institutional restrictions
Significant predictors	Marital status, travel distance	Active cancer diagnosis	Shift from logistical/social factors to emotional urgency
Avg. travel distance	93 miles	65 miles	Shorter travel during pandemic, likely due to elective deferrals
Marital status association	Significant (p < .001)	Not significant (p = .18)	Marital influence diminished under restrictive policies
Cancer status association	Not assessed	Significant (p = .004)	Emerged as strongest predictor during crisis

emotional and logistical support despite policy barriers. However, the shift in predictors—away from structural or relationship-based factors and toward disease urgency—highlights how patients adapt their support-seeking behavior when institutional limitations are imposed.

Emotional Urgency vs. Logistical Support

Our prior work found that being married and traveling longer distances were both associated with higher likelihood of being accompanied to a consultation. This reflected a dual function of companions: logistical support (e.g., driving, navigating unfamiliar hospitals) and emotional partnership during complex medical decisions. However, during the pandemic, this pattern shifted. With fewer patients traveling from distant areas and institutional restrictions in place, logistical and practical considerations were no longer dominant. Instead, the emotional urgency associated with active disease became the strongest predictor.

This shift may reflect patients' intuitive understanding of when support is most needed: consultations involving active cancer carry more immediate emotional weight and higher stakes than those involving prophylactic decisions. Patients facing real-time decisions about cancer surgery may have been more willing to challenge or negotiate institutional policies or to request exceptions based on their perceived need for support.

Theoretical Frameworks: Relational Autonomy and Shared Decision-Making

These findings are consistent with relational autonomy theory, which holds that patients' ability to make autonomous decisions is deeply shaped by their interpersonal relationships. In breast cancer care, support persons often serve as sounding boards, emotional stabilizers, or translators of medical jargon. When these relationships are restricted, autonomy may be diminished—not because patients cannot decide for themselves, but because the process by which they reach those decisions is disrupted.

Similarly, shared decision-making models emphasize the importance of dialogue, understanding, and value-based choices between patients and providers. Support persons can facilitate this process, especially when patients are emotionally overwhelmed or face barriers in comprehension. Provider notes in our study confirmed that companions often asked clarifying questions, helped coordinate care across specialties, and offered emotional regulation in moments of distress. These are all critical functions that contribute to high-quality, patient-centered care.

Educational and Institutional Implications

From an educational perspective, our findings underscore the importance of preparing healthcare providers—particularly in surgical oncology—to recognize the psychosocial roles of support persons and to adapt communication strategies when companions are restricted. When institutions impose visitor limitations, clinicians should be encouraged to facilitate virtual participation via phone or video conferencing, actively include companions when permitted, and use trauma-informed communication methods to support unaccompanied patients.

Institutionally, these findings argue for greater flexibility in visitation policies. While public health emergencies may necessitate restrictions, policies should remain nuanced and prioritize patient-centered exceptions for emotionally charged, high-stakes visits such as surgical consultations, cancer staging, or end-of-life care planning. A blanket restriction on support persons may disproportionately impact patients who rely on relational support to make informed, empowered decisions.

Limitations

This study has several limitations. First, the sample size of the COVID-era cohort is relatively small, reflecting pandemic-related declines in elective visits and institutional access. Second, data were extracted retrospectively, and provider documentation regarding companions was not standardized, introducing potential reporting bias. Third, the comparison group comes from a wider time range (2015–2020), and changing institutional practices over that time may have influenced patient behavior independently of the pandemic.

We also acknowledge that this is a single-center study with a predominantly rural catchment area, which may limit generalizability. Companion dynamics in urban, multicultural, or more resource-dense settings may differ. Lastly, while qualitative observations from provider notes offer rich insight, they do not replace direct patient-reported experiences, which would provide greater depth and validity to interpretations of emotional support and decision-making behavior.

Future Directions

Future research should explore patient and companion perspectives through prospective surveys or interviews, focusing on perceived barriers, emotional needs, and strategies for navigating restrictive policies. Longitudinal studies could examine how these behaviors evolve post-pandemic, as institutions reevaluate and redesign their

visitation frameworks. Additional work is also needed to explore how support dynamics affect long-term outcomes in reconstruction satisfaction, decisional regret, and patient well-being.

Implications for Clinical Practice

Maintaining policies that allow for at least one support person—either physically or virtually—during consultations is crucial. Clinics might consider structured protocols that accommodate safe companion access, including symptom screening, virtual participation via video call, or outdoor waiting areas.

Conclusion

Despite the constraints imposed by the COVID-19 pandemic, this study found that over half of patients presenting for breast reconstruction consultations were accompanied by a support person. Patients with an active breast cancer diagnosis were significantly more likely to bring a companion, suggesting that emotional urgency and informational complexity strongly influenced support-seeking behavior, even amid restrictive institutional policies.

These findings highlight a shift in the drivers of companion presence. While marital status and travel distance were predictive factors prior to the pandemic, they lost significance during this period. Instead, the presence of active disease emerged as the strongest and most consistent variable associated with accompaniment. This suggests that during times of crisis, patients selectively mobilize support based on emotional and decisional need, prioritizing companionship when the stakes feel highest.

As healthcare systems adapt to a post-pandemic landscape, these results advocate for the development of more flexible, patient-centered policies that recognize the essential role of support persons in cancer care. Strategies such as virtual companion participation, structured exception pathways, and trauma-informed communication protocols can help preserve the psychosocial integrity of surgical consultations.

Ultimately, maintaining the patient-companion relationship is not just a matter of comfort—it is integral to informed, value-aligned, and relationally supported care. Institutions must prepare to uphold this standard, even under extraordinary circumstances.

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A Case of Simultaneous Glomus Tympanicum, Glomus Jugulare, and Bilateral Carotid Paraganglioma

Sarah J. Lane, MS IV; Bailey C. Smith, MS IV; and William C. Spanos, MD

Abstract

Paragangliomas are rare neuroendocrine tumors that can arise anywhere from the skull base to the pelvis, but most frequently occur in the head and neck, with the carotid body being the most common site. Subtypes are named according to site of origin, such as glomus tympanicum (behind tympanic membrane) and glomus jugulare (at or near jugular foramen). These tumors may cause cranial nerve deficits depending on location. The following case describes a 51-year-old male who first presented with long-standing right-sided facial paralysis who later developed progressive neurologic symptoms. Imaging revealed multiple head and neck tumors. A multidisciplinary tumor board diagnosed right glomus tympanicum, bilateral glomus jugulare, and bilateral carotid body paragangliomas based on "salt-and-pepper" imaging findings on MRI. Although surgical resection was considered, radiation therapy was ultimately recommended for all of his paragangliomas. The patient underwent radiation therapy with good response and annual surveillance is planned. Given the genetic predisposition for paragangliomas, genetic counseling is essential. Treatment remains individualized, though advances in therapy can improve standardization.

Introduction

Paragangliomas (PGLs) are typically benign neuroendocrine tumors arising from sympathetic or parasympathetic paraganglia, derived from neural crest cells.[1,2] Head and neck paragangliomas (HNPGLs) make up 65-70% of all PGLs but only 0.65% of head and neck tumors. They are usually singular, unilateral, non-metastatic tumors, named according to their site of origin. The most common site is the carotid body, followed by the temporal bone and vagus nerve.[2]

Carotid body paragangliomas arise from the carotid artery adventitia near the bifurcation and present as painless, pulsatile neck masses near the angle of the jaw. Compression of adjacent cranial nerves, particularly the vagus and glossopharyngeal nerves, can cause hoarseness, dysphagia, or autonomic dysfunction.[2] Glomus tympanicum tumors (GTTs) are highly vascular paragangliomas in the mesotympanum of the middle ear, arising along the tympanic branch plexus of Jacobson's nerve (IX) or along the auricular branch of Arnold's nerve (X). These tumors often cause pulsatile tinnitus; larger tumors may also cause conductive hearing loss or vertigo, while smaller tumors can remain asymptomatic.[3] Glomus jugulare tumors (GJTs) are paragangliomas of the jugular foramen that often involve cranial nerves IX, X, and XI, leading to dysphagia, dysarthria, hoarseness, conductive hearing loss, tinnitus, and motor deficits of the trapezius and sternocleidomastoid muscles.[4]

Diagnosis relies on clinical suspicion and confirmation with imaging to localize the primary tumor, detect multiple coexisting tumors or metastatic disease, and guide treatment decisions. MRI is the preferred imaging method due to its detailed soft tissue characterization. Histology and immunohistochemistry can classify tumor differentiation, guide genetic evaluation, and help distinguish paragangliomas from other head and neck tumors. Although most HNPGLs are non-secretory, biochemical testing is recommended to identify elevated catecholamine levels.[2]

While there are reports describing multifocal HNPGLs,[5-8] the presence of concurrent glomus tympanicum, glomus jugulare, and carotid body tumors is not well documented. In this report, we present a patient with multiple synchronous HNPGLs strongly suspected based on characteristic radiologic imaging patterns, including right glomus tympanicum, bilateral glomus jugulare, and bilateral carotid paragangliomas.

Case Presentation

A 51-year-old male with a 25 pack-year smoking history initially presented with right-sided facial nerve paralysis. The patient has no personal or family history of neuroendocrine

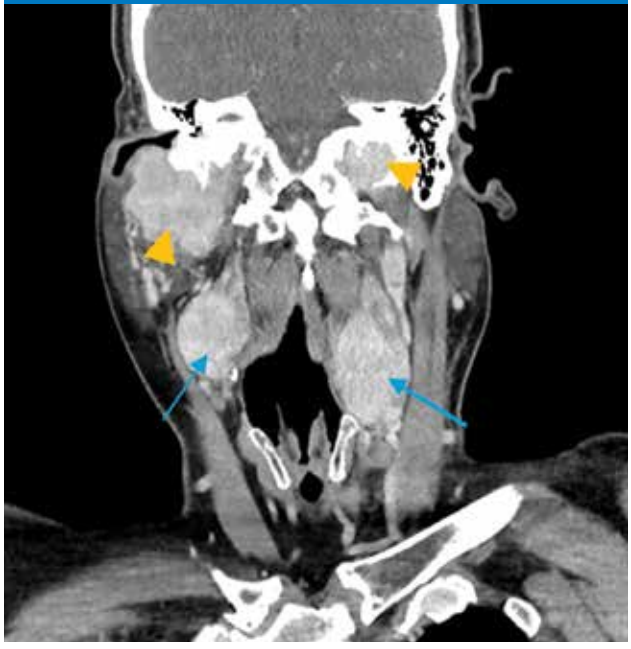
tumors or cancer. This paralysis, presumed to be Bell's palsy, persisted for nearly 10 years and was managed conservatively. He previously declined MRI and neurology evaluation. He later developed bilateral hearing loss and intermittent tinnitus, worse on the right. The following year, he presented with acute left facial swelling, trismus, dysphagia, excessive salivation, ear discomfort, dental pain, and constitutional symptoms. He had not seen a dentist in over 20 years.

Physical exam revealed stable right facial nerve palsy, poor dentition, and left submandibular swelling that was tender and firm on palpation. The right ear canal was erythematous with a polyp and a dull, erythematous tympanic membrane; mild posterior oropharyngeal erythema was also noted.

Work-up and Diagnosis

Labs showed a normal WBC and ESR, but elevated CRP. Contrast-enhanced CT of the neck revealed hyperdense masses in the right parotid gland, right jugular foramen, right carotid bifurcation with bifurcation displacement, left jugular foramen, and along the left carotid sheath, with associated permeative/erosive changes in the skull base (Figure 1). These findings were concerning for multiple bilateral paragangliomas, prompting otolaryngology referral.

Figure 1. Coronal contrast-enhanced CT of the neck soft tissue demonstrating multiple bilateral hyperdense lesions. Yellow arrowheads indicate glomus jugulare tumors arising from the right and left jugular foramina. A 4.7 cm mass in the deep portion of the right parotid gland extends into the right mastoid and jugular foramen with adjacent bony irregularity and possible erosion; the left jugular foramen lesion measures 2.6 cm with adjacent bone erosion. Blue arrows indicate carotid body tumors at the right and left carotid bifurcations. The right carotid body tumor measures 3.9 cm and displaces the bifurcation. Several additional lesions are present along the left carotid sheath, the largest measuring 5.0 cm.

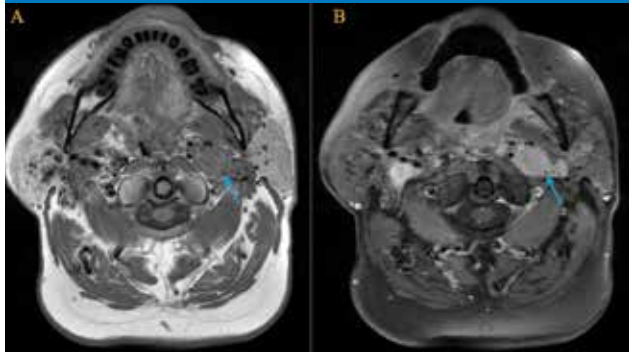


MRI with and without contrast confirmed CT findings, showing avidly enhancing masses with heterogenous T2 hyperintense signal and intermediate T1 signal with scattered hypointense flow voids, features characteristic of the "salt-and-pepper" paraganglioma appearance (Figure 2).[2] MRI also revealed a left second maxillary molar abscess and submandibular sialadenitis, which prompted treatment with Augmentin. Flexible fiberoptic laryngoscopy showed a narrow airway without other abnormalities. Fine needle aspiration (FNA) of the left neck mass was nondiagnostic. Given the bilateral carotid body tumors, a pheochromocytoma workup was initiated; CT of the abdomen/pelvis was unremarkable, but the patient declined catecholamine testing and genetic evaluation.

A multidisciplinary tumor board reviewed the patient's case and concluded the most likely diagnosis was synchronous right glomus tympanicum, bilateral glomus jugulare, and bilateral carotid body tumors. Although histopathologic confirmation was not obtained, the homogenous enhancement on CT and the classic "salt-and-pepper" appearance on MRI are highly characteristic imaging patterns for paragangliomas, decreasing the need for further biopsy.[2] Other hypervascular neoplasms and nerve sheath tumors were considered less likely given the destructive bone changes.

Given the disease extent, multiplicity of tumors, and encasement of the right carotid artery by the glomus jugulare, surgical resection was considered high risk. The tumor

Figure 2. MRI soft tissue neck with and without contrast demonstrating the classic "salt-and-pepper appearance" of the left glomus jugulare tumor. Axial T1-weighted imaging (T1WI) Fast Spin Echo (FSE) (A) shows an intermediate-signal mass with scattered hypointense "pepper" (blue arrow) flow voids. Axial T1WI FSE fat saturation (FS) with contrast (B) demonstrates avid tumor enhancement.



board therefore recommended External Beam Radiation Therapy (EBRT) as the best treatment option for all of the paragangliomas.

Treatment

The patient was referred to radiation oncology for EBRT. A pre-treatment audiogram was ordered but ultimately not completed. Similarly, the patient was encouraged to procure a dental evaluation which is still pending. He received 50 Gy in 25 fractions over five weeks. The patient tolerated radiation with expected side effects of fatigue, xerostomia, dysgeusia, mucositis, radiation dermatitis, nausea, unintentional 10 kg weight loss (about 7.5% of body weight), and right otitis externa resolved with Ciprodex drops. No immediate post-treatment vestibular symptoms, balance issues, or hearing changes occurred.

Follow-up

Due to good response to radiation treatment, monitoring was deemed appropriate by the multidisciplinary team. The patient will receive an MRI in six months and yearly otolaryngology and radiation oncology follow-up.

Discussion

Multiple HNPGLs are uncommon, occurring in approximately 10% of all sporadic cases and up to 35-50% in familial cases. Bilateral carotid body tumors or carotid body tumor associated with tympanic-jugular glomus are the most frequent multifocal presentations.[5] Few cases describe more than three distinct tumors,[6-8] highlighting the rarity of this constellation. Workup for suspected paraganglioma includes biochemical testing and imaging, with genetic evaluation for prognostic and familial considerations. Although histopathology is the diagnostic gold standard, biopsy is discouraged due to risks of hemorrhage and catecholamine release.[9,10] Diagnosis is often achieved through tumor location (e.g., carotid bifurcation, jugular foramen) and characteristic but nonspecific 'salt-and-pepper' imaging features.[11] MRI with and without contrast, as in our patient, shows 70–94% sensitivity, 41–100% specificity, and 85–93% NPV.[12,13]

This degree of tumor multifocality is clinically significant, as it increases the complexity of management and heightens the risk for treatment complications and long-term recurrence. Given the patient's bilateral and synchronous tumors, an underlying germline mutation is likely, although he declined genetic evaluation. Such presentations suggest either an early developmental somatic mutation or an undiagnosed inherited disorder (Table 1), as simultaneous late somatic mutations are less likely. Approximately 35-40% of HNPGLs have an underlying genetic etiology, with over 70% of multifocal PGLs associated with germline mutations, most commonly involving the succinate dehydrogenase complex (SDHx).[14] Because SDHx mutations can predispose to catecholamine-secreting tumors, biochemical testing should be performed to exclude pheochromocytoma before treatment.[2] Identification of a germline mutation has multiple implications, prompting genetic counseling, family member testing, biochemical screening, functional imaging for multifocal disease, and tailored long-term surveillance based on mutation-specific risks.[14]

Treatment of HNPGLs should be individualized, accounting for tumor location, size, symptoms, patient age, comorbidities, and genetic background. Surgical

Table 1.

Syndrome	Mutation	Characteristics
Multiple Endocrine Neoplasia type 2 (MEN 2)	RET proto-oncogene	• Medullary thyroid cancer • Pheochromocytoma • Primary hyperparathyroidism • Paraganglioma (rare)
Von Hippel-Lindau (VHL) disease	VHL tumor suppressor gene	• Retinal and CNS hemangioblastomas • Renal cell carcinoma • Pancreatic neuroendocrine tumors • Pheochromocytomas • Paragangliomas
Neurofibromatosis type 1 (NF1)	NF1 gene	• Neurofibromas • Café-au-lait spots • And other (pheochromocytomas and paragangliomas in minority of cases)
Hereditary Paraganglioma Syndromes	Succinate dehydrogenase (SDH) gene complex: • SDHD (PGL1)* • SDHAF2 (PGL2) • SDHC (PGL3) • SDHB (PGL4)* • SDHA (PGL5)	• Pheochromocytomas • Paragangliomas
Carney-Stratakis Syndrome	*SDHB or SDHD mutations (above)	• Paragangliomas • Gastrointestinal stromal tumors (GISTs)
Other	MAX or TMEM127 mutation Others yet to undergo genotype–clinical outcome evaluation: EGLN1 (PHD2), EGLN2 (PHD1), KIF1B, IDH1, HIF2A, MDH2, FH, SLC25A11, and DNMT3A	• Pheochromocytomas • Paragangliomas

risks include damage to vascular structures and cranial nerves. Surgery is indicated for secreting, malignant, or rapidly growing tumors or if radiotherapy cannot be done.[11] Pheochromocytoma evaluation is recommended before treatment, as radiotherapy or surgery may trigger catecholamine release and cardiovascular crisis.[15,16] While the patient in the above case declined biochemical testing, CT abdomen is highly sensitive (99.6%) for excluding pheochromocytoma.[17] Although surgery was historically the primary treatment for paragangliomas, management has shifted toward non-surgical treatment options (e.g. observation and radiotherapy). Despite this preference, head and neck radiotherapy carries risks including mucositis, dysphagia, xerostomia, and fatigue.[18] Life-threatening adverse effects include osteoradionecrosis, fistula formation, and radiation-induced neoplasms.[19] Radiation involving the ear, cochlea, and vestibular system may also cause hearing loss or infection. Notably, there is a dose-dependent relationship between cochlear radiation and sensorineural hearing loss.[20]

Tumor location helps categorize surgical risk. Carotid body tumors carry a lower risk to cranial nerves compared to other HNPGLs and are often surgically resected, especially in young patients with small to medium carotid body paragangliomas.[11] Regardless of tumor stage, HNPGLs typically respond well to radiotherapy, with local control rates of 94-99% at 5-10 years, though radiographic tumor reduction may take up to 12 months.[21-24] In this patient's case, although some tumors were resectable, the extensive tumor burden and the non-resectable right glomus jugulare favored radiation therapy as primary treatment. Regardless of treatment choice, lifelong surveillance is imperative due to risk for recurrence and multifocal disease.[11]

Conclusion

The coexistence of glomus tympanicum, bilateral glomus jugulare, and bilateral carotid body tumors in a single patient highlights the complexity of managing multiple head and neck paragangliomas. This emphasizes the importance of imaging, genetic evaluation, and lifelong surveillance. Multidisciplinary collaboration is essential to tailor individualized treatment plans that balance the risks and benefits of surgery and radiotherapy. Additional development and investigation of treatment options is necessary to further standardize treatment of this disease pathology.

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Infantile Basal Ganglia Infarct due to Mineralizing Angiopathy: A Case Report

Ashley Strube, DO; Callie Olson, MS IV; and Gokhan Olgun, MD, FAAP

Abstract

An 11-month-old female infant without any significant past medical history presented to an outside facility emergency department due to acute onset hemiparesis. Initial head CT imaging was negative for acute ischemic stroke (AIS). The patient was transferred to our children's hospital for further evaluation and management. Previous head imaging was read again by a pediatric radiologist who reported AIS of the basal ganglia with what was thought to be punctate hemorrhages surrounding the penumbra. After further MRI imaging studies were completed, the area initially believed to be punctate hemorrhages was identified instead as microcalcifications of the lenticulostriate arteries, and a diagnosis of mineralizing angiopathy was made. Given this entity's scarcity of documented cases, it is important for physicians to be aware of the diagnosis, as well as the associated neuroradiologic findings.

Introduction/Background

Childhood ischemic stroke impacts approximately 1 in 100,000 children in developed countries every year and is an important contributor to acquired cerebral injury in the pediatric patient.[1] Though cardiac disease, which is present in up to 30% of pediatric AIS cases, and genetic predisposition (eg. sickle cell disease) are prevalent contributors to acute ischemic stroke (AIS) in children, there are less commonly identified conditions which must be considered in the differential diagnosis.[2] Mineralizing angiopathy is a rarely reported pediatric disease of vasculature in the brain. It is the result of calcifications in the vasculature that impact blood flow, which can result in infarcts of the brain and presentation to emergency departments and ICU settings with stroke symptoms.[3] This is a report of pediatric stroke found to be secondary to mineralizing angiopathy, a rarely reported diagnosis, which highlights the importance of a thorough etiological investigation.

Case Report

An 11-month-old female infant with no past medical history presented to an outside emergency department with an acute onset of right-sided hemiparesis. The child was unvaccinated and has no primary care provider. The family denies recent trauma or fevers but endorsed recent diarrhea and tugging on her ears.

The infant was playing in a gated play area by herself with toys when her mother went to check on her and noticed she was acting differently. When there was no improvement in her symptoms, the family brought her into the outside facility for evaluation. Initial complete blood count (CBC), complete metabolic panel (CMP), and C-reactive protein (CRP) were within normal limits. On emergency department evaluation, noncontrast CT of the head and cervical spine were read as unrevealing, but later reread to reveal what was believed to be an old basal ganglia infarct on the left side with punctate hemorrhages surrounding the penumbra. Due to this finding in a patient with no improvement in symptoms in a rural facility setting, she was transferred to our children's hospital for further evaluation and management.

Physical examination on admission was significant for bilateral serous otitis media, bite marks on the tongue, right facial droop, patellar reflexes 2+ bilaterally, Babinski extensor in the right great toe and right-sided hemiparesis of the upper and lower extremities. A non-contrast MRI was read as a left-sided basal ganglia acute infarct with petechial hemorrhage within infarct margins. Next, an MRA head and neck was obtained and normal. Extensive infectious workup, which included lumbar puncture, CSF culture, meningitis/encephalitis panel, blood culture, SARS-CoV-2 testing, and comprehensive respiratory panel, was negative. A transthoracic echocardiogram and EKG were obtained and were negative to rule out a patent foramen ovale. Hematologic workup for hypercoagulable states exhibited only heterozygosity for Factor V Leiden gene (c.1601G>A variant). Whole genome sequencing was done, and it was negative. Secondary

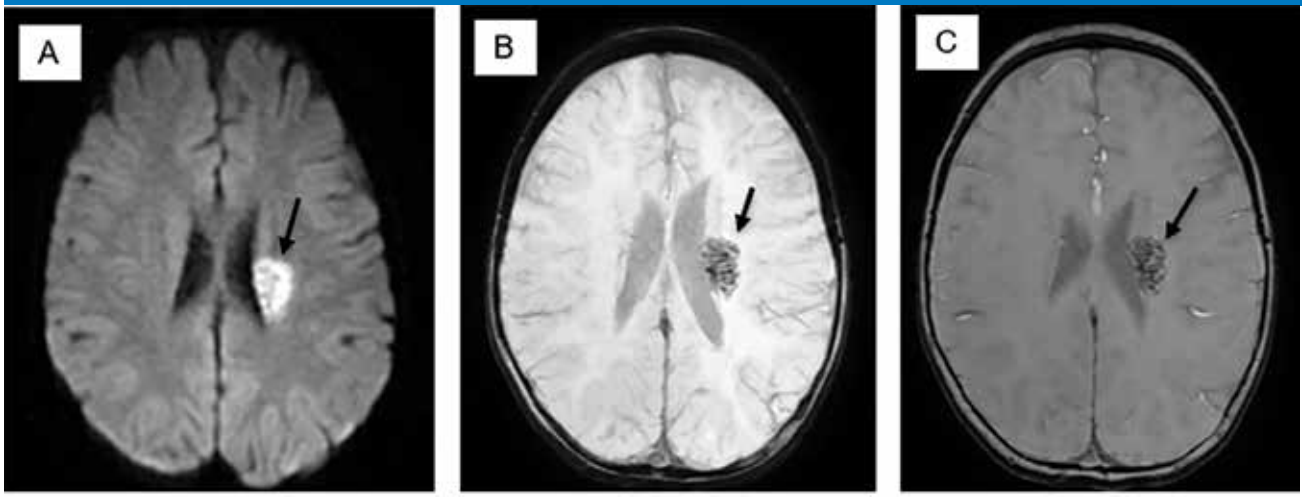
review of the patient's head imaging revealed that the non-contrast head CT demonstrated bilateral basal ganglia foci of hyper density with corresponding hypo intensity on MRI GRE, distributed along the course of the lenticulostriate branches of the middle cerebral arteries. Bilateral symmetric involvement aligning with vascular territories and degree of density of CT favors calcifications rather than hemorrhage. In conjunction with literature review, it was determined by the stroke team that this patient's presentation was consistent with a rarely documented mineralizing angiopathy of the lenticulostriate arteries.

As far as treatment was concerned, there was discussion on appropriate timing to start low-dose aspirin therapy. In discussion with several subspecialties, the decision was made to initiate low-dose aspirin therapy (40.5 mg daily) two weeks after discharge, when the acute phase of her condition is resolved. Total duration was tentatively planned for one year, with pediatric neurology follow-up 3 months after discharge. Risk of recurrence of this condition is low based on literature review although studies with long term follow up are lacking. Additionally, she participated in physical therapy while in the hospital and was discharged with outpatient therapies to work on strength. The patient had gradual improvement in hemiparesis throughout her three-day hospital admission, with no notable neurologic deficits.

Discussion

Acute ischemic strokes involving basal ganglia after minor head trauma constitute less than 2% of all childhood ischemic strokes.[3] Affected children with this condition typically present with hemiparesis and evidence of basal ganglia infarct on imaging. Mineralizing angiopathy of lenticulostriate arteries in children presenting as acute basal ganglia stroke was first described as a clinicoradiological syndrome by Lingappa et al. in 2013.[3] All the children in a prior case series presented at the mean age of 11.7 months, with our patient presenting at 11 months. In a case series, all children presented with the same physical exam findings as our patient (facial droop, hemiparesis). From a pathophysiology perspective, a proposed mechanism for mineralizing angiopathy is that mechanical forces during head trauma cause excessive stretching. In infancy, there is an acute angle between the middle cerebral artery and lenticulostriate arteries, increasing the risk of mechanical injury with simple trauma. Although our patient did not have any known trauma prior to the ischemic event. In a previous case series, Magnetic resonance imaging (MRI) showed acute infarct in the basal ganglia region, and magnetic resonance angiogram (MRA) was normal in all the children. MRI is not considered gold standard imaging for mineralizing angiopathy as it can fail to identify mineralizing angiopathy of lenticulostriate arteries. Computed tomography (CT) brain study showed basal ganglia calcification in all the children in the case series, which can be inaccurately interpreted as petechial hemorrhages, which was noted in our case. When a basal ganglia infarct is identified on MRI in the age group of 6 months to 24 months, it is preferable to do a thin-sliced multiplanar reconstruction CT to delineate linear calcification in lenticulostriate vessels, confirming mineralizing angiopathy of lenticulostriate arteries.[3] This patient did not undergo thin-sliced multiplanar reconstruction CT as the clinical picture and MRI radiologic findings were satisfactory to make

Figure 1. Non-contrast magnetic resonance imaging of the brain showing a left-sided basal ganglia infarct with microcalcifications as noted by the arrows. a. Ax DWI ALL, b. Multiplanar reconstruction, c. 3D Ax SWAN.



the diagnosis and reduce radiation exposure to this infant. Per literature review, a diagnosis of mineralizing angiopathy has a favorable prognosis with standard antithrombotic therapy, aspirin. However, the role of aspirin and its duration for treatment is not yet well established.

Conclusion

This case report adds to the literature on presentation and evaluation of infantile basal ganglia stroke associated with mineralizing angiopathy of lenticulostriate arteries. Infantile ischemic stroke of the lenticulostriate arteries due to mineralizing angiopathy is a rarely identified phenomenon. Since imaging findings of pinpoint hemorrhage and calcifications can appear similar, it is important for mineralizing angiopathy to be included in the differential diagnosis for young children presenting with stroke-like symptoms in order to accurately and efficiently diagnose. When a basal ganglia infarct is identified by MRI it is important to perform a thin-sliced multiplanar reconstruction CT to delineate linear calcification in the lenticulostriate vessels, confirming mineralizing angiopathy of the lenticulostriate arteries.

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A Recurrent Case of Reactive Infectious Mucocutaneous Eruption (Rime) in a Young Adult Male: A Case Report

Elise Meide, MS IV; and Scott Kindle, MD

Abstract

Reactive infectious mucocutaneous eruption is a new classification as of 2021. It describes a parainfectious eruption that may be difficult to distinguish from Stevens-Johnson syndrome, toxic epidermal necrolysis, and erythema multiforme in its early stages. We present a likely fifth recurrent case in a young adult male, who was treated empirically with his condition improving three days post-admission.

Introduction

In 2015, the term *mycoplasma pneumonia* induced rash and mucositis (MIRM) was introduced by Canavan et al. to distinguish it from erythema multiforme, Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis.[1] Up to 79% of MIRM cases were previously classified as SJS or EM in the literature. In light of several other infections causing a similar clinical presentation, in 2021, Ramien proposed expanding the name to reactive infectious mucocutaneous eruption (RIME).[2] Given the recent name expansion, in this report when using the term RIME, it is with the understanding that MIRM is classified within RIME.

Canavan et al.'s systematic review found that patients with MIRM were often young males with an average age of 11.9 ± 8.8 years [1] It is likely heavily underreported due to previously being on the erythema multiforme spectrum. The pathophysiology of MIRM or RIME are not fully elucidated, however, theories for MIRM include molecular mimicry with the mycoplasma P1 adhesin protein and keratinocyte antigens which then cross react with autoantibodies against mucosal antigens, polyclonal B cell and plasma cell proliferation leading to immune complex deposition and complement activation.[2] It is hypothesized that there may be a genetic role in susceptibility to RIME and recurrences as well.[1,3,4] The pathophysiology of other pathogens, which include *Chlamydia pneumoniae,* human parainfluenza virus 2, rhinovirus, adenovirus, enterovirus, human metapneumovirus, influenza A and B, COVID-19, and Group A streptococcus are unknown.[2,5-9]

Patients typically present with prodromal symptoms of cough, malaise, and fever one week prior to their eruption.[1] Proposed diagnostic criteria include skin detachment of <10% body surface area, two or more mucosal sites involved, few and fleeing morbilliform lesions or few vesicles, and clinical or laboratory evidence of atypical pneumonia.[1] Lesions are typically vesiculobullous, targetoid, atypical targets, and macules that are scattered on the extremities and occasionally face.[1]

RIME has a better prognosis than SJS/TEN.[1] Many of the reported mortalities originate from the pre-antibiotic era and occurred in patients with significant respiratory disease.[1] Generally, patients recover after experiencing a mild course.[1,7] Significant mucositis is a major cause of morbidity and indication for hospitalization, and ocular complications can occur such as conjunctival shrinkage, corneal ulcerations, blindness, ocular synechiae, dry eyes.[1] Here we report the case of a young, adult male presenting with a likely fifth recurrence of RIME.

Case Report

A 24-year-old Native American male presented after outpatient management of a mucocutaneous eruption. Prior to the eruption, he had a one-week viral prodrome of rhinorrhea, conjunctivitis, and cough. He had no fever on admittance but was tachycardic with hypertension. His prior history included oral lesions the past four springs following similar viral prodromes. On presentation he had rhinorrhea, chills, red eyes, cough, sores on his lips (Figure 1), mouth, penis, and focal blister like areas on extremities (Figures 2 and 3). It was difficult for him to eat and urinate due to pain from ulcers and scabs. As an outpatient, he was prescribed valacyclovir and a superficial skin scraping for rapid testing of HSV was taken. Valacyclovir did not relieve symptoms after

Figure 1. Hemorrhagic crusted vesicles and coalescing vesicles on oral mucosa.

Figure 2. Lower extremity violaceous, targetoid-like patches with central crusted erosions from bullae and vesicles.

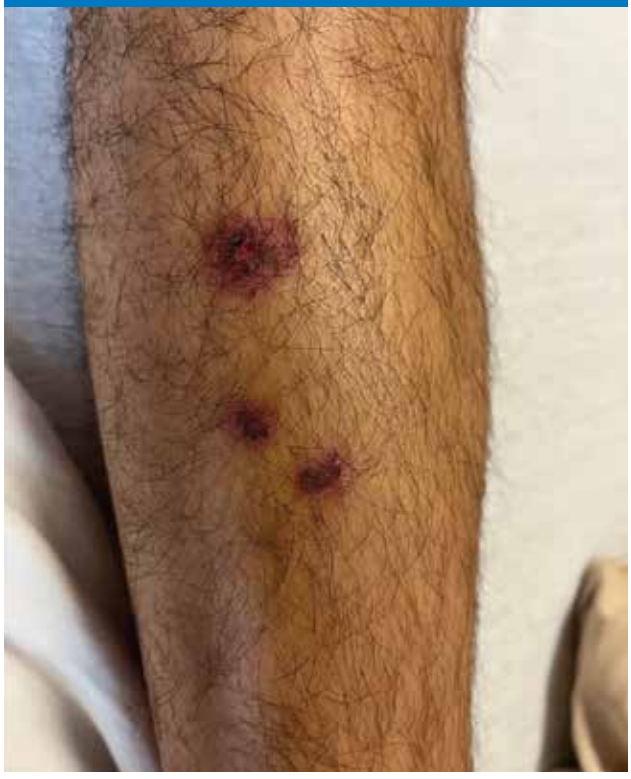

Figure 3. Lower extremity violaceous, targetoid-like patch and macule with central crusting.

1 week and the HSV test was negative, prompting admission with concern for possible SJS. The patient denied ever having sexual intercourse or oral sex. Patient reported a tick bite two weeks prior.

Dermatology and infectious disease were consulted. Physical exam revealed widespread crusted erosions involving most of the upper and lower vermilion lip, focal erosions and ulcerations of the tongue and buccal mucosa, and focal atypical violaceous targetoid-like patches, some with central vesicles or bullae, on the arms and legs, with healing ulcers and erosions of the penis and scrotum. CBC and BMP were within normal limits, CRP was 71.2.

Dermatology was supported by infectious disease to favor the diagnosis of RIME. Follow-up testing included mycoplasma pneumonia IgG, IgM, IgA, viral respiratory panel, chest X-ray, COVID-19, MMR titers, monkey pox, HSV1 and HSV2, VZV, HIV, RPR, hepatitis B and C, Lyme, Anaplasma, and Ehrlichia serologies. Complete laboratory results were pending at discharge, making RIME the favored diagnosis.

The patient was treated supportively with fluid, nutrition, and pain management. High dose prednisone, nystatin mouth wash, doxycycline, and fluconazole for concerns of secondary thrush were initiated. Due to pending results,

valacyclovir was continued for an additional week. The patient was discharged with improvement on day three, after ophthalmology consult. He was lost to subsequent follow-up. After discharge, *Mycoplasma pneumoniae* IgM and IgG results returned with levels of 2.17 and 1.42 respectively, indicating recent infection and confirming a RIME diagnosis. HSV1 and HSV2 IgG antibodies were also positive, with all other test results negative.

Discussion

Early presentation of RIME lesions may be difficult to distinguish from SJS/TEN and EM. In this case, the patient had a prodrome of cough and malaise one week prior to his visit with his primary care physician, along with rhinorrhea. With previous episodes, his presentation mainly affected oral mucosa. At time of admit, the lesion distribution on oral, ocular, and urogenital areas with limited cutaneous involvement was consistent with RIME distribution, which Canavan et al. found to affect the oral cavity (94% of cases), ocular involvement (82% of cases), urogenital lesions (63%), acral and extremity areas (46%), generalized (31%), and truncal (23%), with 47% of cases having limited cutaneous involvement.[1]

When considering differential diagnoses, compared to RIME, SJS is drug induced rather than infection related, with extensive, centrally distributed target lesions, is much more severe, often leading to ICU admission, and occurs more often in adults.[4] RIME typically does not have the desquamation associated with SJS/TEN. Erythema multiforme classically has acral targetoid lesions, which are less common in RIME, as are cutaneous lesions in general. Hand-foot and mouth disease presents with discrete, painful ulcers and vesicles with cutaneous involvement and no ocular involvement. Histopathology of RIME is not well known, lesions will have apoptotic keratinocytes and sparse perivascular inflammation that is often indistinguishable from SJS or EM.[10] Features of SJS that mitigate against RIME include extensive necrotic keratinocytes, dense dermal infiltrates, RBC extravasation, pigment incontinence, parakeratosis, and high numbers of eosinophils or neutrophils.[10,11] Due to the unreliability of histopathology to definitively differentiate between SJS and RIME, we would not recommend biopsy at this time.

RIME is often a clinical diagnosis; however, an infectious workup with chest X-ray to detect a current infection or an atypical pneumonia may prove helpful for diagnosis.[2,6] The patient's upper respiratory presentation and recent tick bite resulted in an extensive infectious workup. Post-discharge, the positive IgM *M. pneumonia* results indicate it as the likely culprit for this patient's RIME episode.

Treatment for this patient was consistent with reports in literature; it was primarily supportive, with the addition of systemic corticosteroids. With any infectious cause, it is important to weigh the benefits of using systemic corticosteroids with the cost of immunosuppression. RIME frequently self-resolves, however, reported RIME management is to treat any underlying infection, with supportive care focused on hydration, mucosal and cutaneous wound care.[7,8] Treatments for RIME frequently include systemic corticosteroids for 3-5 days, although cyclosporin, IVIG, and etanercept have been cited in literature.[6,12] These are treatments for SJS, and in some contexts, used when SJS was thought to be the initial diagnosis.[1,2] Given a lack of controlled studies, it is unclear whether these treatments are helpful in the context of RIME.

The patient in our case was much improved after three days of care in the hospital. Anywhere from 8-38% of patients will experience a recurrence.[1,6] Recurrences may be atypical with lack of an infectious prodrome and increased likelihood of ocular, genital, and cutaneous lesions rather than oral.[12] This was the case with our patient, who had not previously experienced cutaneous lesions. Recurrences may occur several times, with one patient reported to have four recurrences, similar to our patient.[7]

Overall, RIME is a mild disease course that may be difficult to parse out from SJS or EM in early presentation. Patient history such as age, current infection and lack of prior drug exposure, with mainly mucocutaneous involvement can help direct the diagnosis to RIME rather than a more severe disease.

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Please note: Due to limited space, we are unable to list all references. You may contact South Dakota Medicine at ereiss@sdsma.org for a complete listing.

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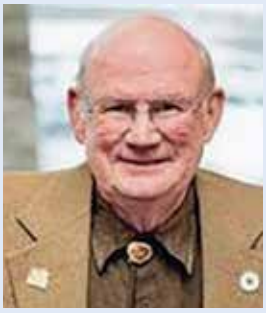
In Memoriam 2025

Honoring physician members of the SDSMA who passed away in 2025.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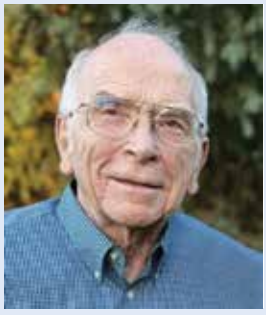
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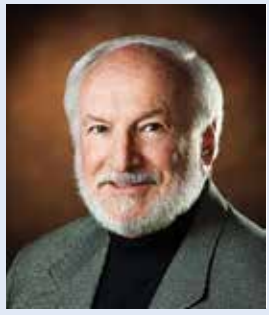
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Member News

Visit www.sdsma.org for the latest news and information.

Thank You, Doctors of the Day!

A special thank you to the following members for volunteering their services during the 2026 legislative session:

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- Rob Allison, MD
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- Jerome Bentz, MD
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- Eric Towe, MD
- Jenna Wickersham, DO

The SDSMA Doctor of the Day program is responsible for providing a service to legislators and their assistants and attending to any medical emergency situations that may occur at the Capitol in Pierre during the legislative session. The Doctor of the Day program not only provides needed medical services for our legislators, but it also provides for a positive image of physicians and organized medicine.

2026 SDSMA Annual Leadership Conference is May 29

The 2026 SDSMA Annual Leadership Conference is Friday, May 29 at the Catlin Hotel (formerly the Hilton Garden Inn) Downtown Sioux Falls. Be sure to also join us for a mixer the evening prior on Thursday, May 28 at the SDSMA's new office at 1610 S Minnesota Ave. The District 7 Medical Society is sponsoring the mixer.

This year's conference will focus on a comprehensive, evidence-based approach to applying lifestyle medicine to today's health challenges. Physicians will explore practical methods for integrating lifestyle medicine fundamentals into daily clinical practice to improve patient outcomes. The information will provide physicians with actionable strategies to enhance long-term outcomes and elevate their approach to preventive care.

With presentations, a panel discussion, medical student poster session, networking opportunities and the awards banquet, the Annual Leadership Conference is a great time to share ideas and learn from fellow members.

Do you have a policy issue you'd like to bring to the SDSMA's attention? Schedule a time to address the SDSMA Policy Council during the Membership Open Forum. Watch sdsma.org for policy submission information to be posted soon.

The Annual Leadership Conference is a benefit of your membership – there is no registration fee for members. Tickets are required for some events and meals, and will be available for purchase at sdsma.org.

Follow us on Social Media!

Stay up to date with the latest from the South DakotaState Medical Association.
We are on Facebook, Twitter, and Instagram! Follow and connect with us.

For Your Benefit:

Fighting for You and Your Patients

The SDSMA serves as your vehicle for advocacy for your patients and the art and science of medicine through lobbying at the state and federal levels, grassroots activity, and legal initiatives.

SDSMA PAC is your grassroots avenue that works to impact public policy decisions through bipartisan political participation. SDSMA PAC supports and elects pro-medicine candidates on the state level. Members of the SDSMA and their spouses can join SDSMA PAC.

The SDSMA's motto is "Values, Ethics, Advocacy." We take our advocacy role to heart. With your help, SDSMA and SDSMA PAC have the opportunity to dramatically impact the political and legislative process to create meaningful changes in South Dakota's current health care system:

- Improving health and access to care in rural areas;
- Increasing Medicaid reimbursement;
- Promoting Medicare physician payment reform and stopping reimbursement cuts;
- Working to improve clinical quality and patient safety;
- Partnering with state agencies to tackle regulatory, socioeconomic, public health and scientific policy issues;
- Advocating for public health immunizations;
- Promoting adequate funding for medical education;
- Stopping inappropriate expansion of non-physician scope of practice;
- Defending the patient-physician relationship; and
- Reforming medical liability.

If you would like to become involved in any of our advocacy programs, call 605.336.1965 or visit sdsma.org.

"For Your Benefit" is the Association's monthly update on programs and services available to physicians through their affiliation with the SDSMA.

2026 Annual Leadership Conference – Sponsorship & Advertising Opportunities!

The SDSMA invites you to showcase your organization as a key supporter of the 2026 Annual Leadership Conference. This year, we gather on May 29, 2026, at the Catlin Hotel in downtown Sioux Falls to explore the future of clinical practice through the lens of lifestyle medicine.

Why Sponsor?

Sponsoring or advertising during the SDSMA Annual Leadership Conference shows your support for the association's physicians, residents and medical students, helping defray the association's costs incurred to bring educational sessions and activities to attendees throughout the day and evening. Sponsors and advertisers are recognized as key partners in this important event. In addition to speaker sessions, those attending the conference will have an opportunity to network with colleagues and attend a poster session featuring the work of USD SSOM students. During the evening events, physician leaders and SDSMA award recipients will be celebrated and medical students receiving scholarships from the SDSMA Foundation will be recognized.

Theme: Lifestyle Medicine

This year's conference, for all South Dakota physicians whether they are in primary care, surgery, or a subspecialty, will focus on a comprehensive, evidence-based approach to applying lifestyle medicine to today's health challenges. Physicians will explore practical methods for integrating lifestyle medicine fundamentals into daily clinical practice to improve patient outcomes. The information will provide physicians with actionable strategies to enhance long-term outcomes and elevate their approach to preventive care. Sponsors and advertisers show attendees that they align with the pursuit of better patient outcomes and the advancement and celebration of physician and medical student leadership in our state.

To sponsor or advertise, please sign up at sdsma.org.

Member News

Legal Brief Highlight: Retention, Transfer and Disposition of Medical Records

Under state law, medical records must be maintained for at least 10 years. In the case of minors, records must be kept until the child is 20 years old.

The HIPAA mandated privacy rules allow patients copies of their records for as long as they are maintained. After 10 years, records may be destroyed, but an index of all destroyed records must be maintained, and 30-day notice must be given to active patients prior to records destruction. The notice must give a deadline prior to which the records may be claimed.

Prior to destruction of the active patient records, the facility must prepare and retain an index with name of the individual whose records were destroyed, medical record number, date of birth, a summary of visit dates, the attending or admitting physician and diagnosis or diagnosis code.

Records may only be transferred to certain entities named in state law – to another physician, clinic, or other health care facility, a corporation organized for the purpose of operating a health care clinic, or a patient or patient's representative who has been properly designated in accordance with state or federal law.

State law also specifically addresses the disposition of medical records in case of facility closure. If a facility closes, medical records must be properly maintained, but may be transferred to a different facility to do so.

For more information, download the SDSMA legal brief at sdsma.org. The SDSMA provides legal briefs for member physicians on a variety of rules and regulations that apply to the medical profession. For nonmembers, legal briefs are available for purchase.

Don't Let Your Member Benefits Expire.

Last Chance to Renew!

Thank you for your membership in the SDSMA. Association renewal is annual and runs on the calendar year. If you haven't yet, don't let this be your last issue of *South Dakota Medicine*! Please visit the link /instructions that were sent to your email to renew.

We look forward to another great year of providing physicians with valuable benefits. SDSMA membership gives you access to networking and leadership opportunities with your local colleagues in your district medical society, a subscription to the peer-reviewed journal *South Dakota Medicine* and waived manuscript submission fees, your name and practice information in the physician directory, and advocacy on behalf of patients and the medical profession.

- **Advocacy.** Participate in opportunities to have your voice heard. The SDSMA advocates at the state and federal levels on key health care issues impacting patients and physicians.
- **Professional growth.** Grow leadership skills through the SDSMA Health Leadership Institute, committee involvement, and events.
- **Well-Being.** Navigate the stressors of today's ever-changing healthcare landscape and prioritize wellness with the South Dakota Physician Well-Being Program.

Thank you to those who have already renewed. If you haven't yet, please complete your renewal today!

Don't forget to send in your favorite scenic photo for

South Dakota Medicine

front cover consideration. Send photos to ereiss@sdsma.org.

South Dakota Medicine, the monthly peer-reviewed medical journal published by the South Dakota State Medical Association, is read by physicians, residents, medical students, hospital and clinic administrators, and other health care leaders. SDSMA members receive the journal through a mailed subscription as a member benefit and have access to full issues at sdsma.org.

With a 100-year history as the state's leading provider of medical information, *South Dakota Medicine*'s original research, educational articles and association news combine to offer you a comprehensive information support system that can help with the decisions you make every day. Additionally, the journal is indexed in PubMed and has unmatched reach and unsurpassed readership within its field, making it unique in meeting the needs of all physicians in state – from retired doctors and primary care physicians to specialists, medical students and residents. Articles published by students and residents in a PubMed-indexed journal strengthen residency and fellowship applications.

Submit a Manuscript

Are you interested in having your work published? *South Dakota Medicine* editors review many manuscripts each year, and we encourage article submissions. Please confirm that your manuscript meets the guidelines at www.sdsma.org/SDMed before submitting for review.

Support the Journal

South Dakota Medicine brings important medical information to South Dakota's physicians, and advertising in the journal generates revenue that helps support the SDSMA's ability to publish this high-quality, peer-reviewed journal. Help support *South Dakota Medicine* by advertising your practice while gaining excellent exposure – find more information at www.sdsma.org.

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