August 2025
Volume 78
Number 8

South Dakota medicine

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August 2025
Volume 78 | Number 8

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South Dakota medicine

The Journal of the South Dakota State Medical Association

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Sioux Falls, SD 57105
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South Dakota Medicine
(ISSN 0038-3317)
Published 12 times per year with one special issue by the South Dakota State Medical Association.

The SDSMA thanks the University of South Dakota Sanford School of Medicine for its financial contributions toward the production of South Dakota Medicine.

Subscription price: $50 per year domestic
$65 per year foreign, $8.95 for single copy

Periodicals postage paid at Sioux Falls, South Dakota and additional mailing offices.

Postmaster: Send address changes to
South Dakota Medicine
2600 W. 49th Street, Suite 100
Sioux Falls, SD 57105

SDSMA Home Page: www.sdsma.org

AMA Home Page: www.ama-assn.org

Printer:
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Beef Tallow and Beyond: Confronting Dermatologic Misinformation with Compassion and Cultural Fluency

Kianna Thelen, MS IV; and Mandi Greenway, MD

In the age of TikTok dermatology, we now encounter patients who walk into clinics quoting influencers instead of clinicians. Among the latest viral skincare trends: beef tallow. This rendered animal fat, once relegated to antique recipes, has reemerged as a self-styled miracle balm, praised for its simplicity, affordability, and "natural" appeal. Dermatologists, understandably, raise an eyebrow—yet outright dismissal misses the point.

This editorial aims to challenge the reflex to reject such trends wholesale and instead advocate for an empathetic, culturally aware approach that helps patients navigate skincare misinformation without shame.

Why Tallow? Why Now?

Beef tallow is not just a trend; it's a symptom. Patients turn to such alternatives because they feel disillusioned by expensive regimens, overwhelmed by ingredient lists, or unheard in medical settings. Tallow promises fewer ingredients, nostalgic authenticity, and peer validation via online communities.

And let's be honest: some users report relief from dry skin or eczema—likely from its occlusive properties, which reduce trans-epidermal water loss. But there's a caveat. Tallow is not regulated, may be comedogenic, and lacks controlled trials to support its safety or efficacy. Dermatologists have safer, proven alternatives in our toolkits—ceramide-rich moisturizers, fragrance-free petrolatum-based products, and barrier repair formulations.

Still, facts alone don't win hearts. Trust does.

What This Means for Dermatologists

The rise of DIY skincare—whether castor oil, chlorophyll drops, or beef tallow—exposes a larger truth: we are no longer the sole gatekeepers of skin advice. The digital age has democratized information, for better or worse.

Instead of fighting this shift, dermatologists can lean into it. The solution isn't just rebuttal. It's dialogue. A few key strategies:

Ask before advising: Begin with curiosity. Why did they choose this? What's worked for them? What hasn't? This builds rapport and identifies underlying needs.

Validate, then educate: Recognize the legitimacy of their search for better options. Then explain—respectfully—the risks and evidence-based alternatives.

Offer bridge products: If patients want simple, natural-feeling solutions, suggest fragrance-free, minimalist formulations. Meet them halfway.

Join the platforms: Your voice matters online. Posting clear, kind, digestible content can help counter misinformation and reach patients where they scroll.

Digital Advocacy is Clinical Care

For many, especially in rural or underserved areas, dermatologic care begins not with a referral—but with a hashtag. That's why engaging on platforms like Instagram and TikTok is no longer optional for those of us who want to guide patients before they go viral.

This isn't about self-promotion. It's about patient education. A dermatologist explaining why beef tallow might clog pores may prevent a breakout or an ER visit later. It's public health by another name.

Conclusion

Tallow isn't the enemy. Misinformation is—and it thrives when patients feel dismissed. By listening first and correcting second, we honor both science and humanity. We propose that dermatologists embrace their role not just as clinicians, but as culturally fluent communicators and digital advocates.

If we want to be the voice patients trust, we have to speak their language—and that starts by respecting their journey.

REFERENCES

1. Draelos ZD. The science behind skin barrier repair. J Clin Aesthet Dermatol. 2018;11(8):12-17.
2. Desai SR, et al. Dermatologic misinformation on social media. JAMA Dermatol. 2020;156(4):462-4.
3. Cohen BA. Social media and dermatology. Clin Dermatol. 2021;39(6):827-9.
4. Akram W, et al. Tallow, rendered animal fat, and its biocompatibility with skin: a scoping review. Cureus. 2024;16(1):e51591.
5. Kassamali B, et al. Natural skin care: risk and responsibility. J Drugs Dermatol. 2022;21(6):586-9.

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Artificial/Augmented Intelligence

Keith Hansen, MD
President, South Dakota State Medical Association

At this year's SDSMA Annual Leadership Conference, we had excellent discussions about the current state of artificial/augmented intelligence (AI) in healthcare, its rapid expansion, and its use in South Dakota. We were fortunate to listen to talks on this topic by healthcare leaders with expertise on AI from Avera Health, Monument Health, and Sanford Health. These talks reinforced the rapidly evolving field of AI and their application to health care especially in South Dakota and how much change has occurred in the last couple years.

AI holds promise in improving patient care, research and medical education. The AMA notes that "augmented intelligence" is a better term for AI in medical care, as it will never replace the physician and a physician will always be important and integral in interpreting information and applying it to the healthcare of the patient. One area where AI may be valuable is in precision medicine, which is healthcare targeted to the individual using psychosocial, biometric, genetic and phenotypic data to arrive at the "right treatment for the right patient at the right time." AI is very helpful in evaluating and interpreting large amounts of data and making it readily available to the clinician to treat their patients, such as those with chronic diseases, like diabetes mellitus where AI could allow for the application of precision medicine and evidence based medical care. Psychosocial determinants of care include social determinants of health such as rural vs. urban, geographic location (such as whether the patient lives in a 'food desert'), financial and insurance issues, age, mental health issues, and other issues. Biomarkers include laboratory tests and imaging such as the hemoglobin A1C level as a reflection of glucose control in diabetes mellitus. Genetic/genomic data includes large amounts of data such as sequencing the patient's exome and genome – which one use is the selection of an appropriate therapy for the patient based on expected drug metabolism. The phenotypic evaluation depends on the complete history, past medical history, social history, family history and physical examination of the patient conducted by the physician. The history and physical examination can then be combined with the psychosocial, biometric and genomic data by AI to assist the physician with diagnosis, a personalized evidence-based treatment plan, prediction and assistance in prevention of short-and long-term complications, and enhancement of patient participation in their management plan. The use of AI in medical care will require a paradigm shift from the usual patient-physician interaction to the tripartite; patient-physician-AI interaction. AI also holds the promise of automating repetitive tasks such as documentation, pre-authorizations, billing and other tasks while also improving analysis of data and developing an evidence-based plan of management. There are a number of potential risks with AI, including patient privacy and safety.

With the rapidly increasing use of AI in medical care, the SDSMA Board of Directors is forming a special Committee on Artificial Intelligence to develop a white paper on important factors in the use of AI. This committee will also look at the adoption of association policy in this area. I look forward to the committee's work guiding the ethical and effective integration of AI, ultimately benefitting both physicians and patients across our state.

Prenatal Diagnosis of Placental Mesenchymal Dysplasia and Its Association with Hepatic Mesenchymal Hamartoma in Beckwith-Wiedemann Syndrome: A Case Report

Haley S. Jerman, MS III, PA-C; and Rachel L. Rodel, MD

Abstract

Placental mesenchymal dysplasia (PMD) and hepatic mesenchymal hamartomas are rare diseases associated with Beckwith-Wiedemann Syndrome (BWS). We present the case of a 22-year-old diagnosed with PMD at 24 weeks gestation who required emergent delivery secondary to fetal distress and preeclampsia at 30 weeks' gestation. The neonate was diagnosed with a hepatic mesenchymal hamartoma following delivery. While genetic testing returned negative, a clinical diagnosis was made for BWS due to persistent hypoglycemic episodes, left lower extremity hyperplasia, an umbilical hernia, nephromegaly, bilateral ear creases, and periorbital creases. This case demonstrates that PMD may be the only prenatal indicator of BWS.

Introduction

Placental mesenchymal dysplasia (PMD) is a rare disorder characterized by placentomegaly and dilated chorionic plate vessels with thrombosis.[1] The incidence of PMD is cited between 0.002-0.2% of pregnancies, and approximately 20% of these cases are associated with Beckwith-Wiedemann Syndrome (BWS).[1] BWS is characterized by diverse phenotypic findings, including overgrowth, macroglossia, neonatal hypoglycemia, and an increased risk of embryonal tumors.[2] This case presents an unusual combination of PMD without other prenatal indicators for BWS and subsequent detection of a neonatal hepatic mesenchymal hamartoma.

Clinical Course

This 22-year-old patient presented at 24 weeks gestation for evaluation of cystic placentomegaly on ultrasound (shown in Figure 1). The fetus appeared structurally normal with normal growth and amniotic fluid. The patient had previously completed screening in her first trimester with cell-free DNA for trisomy 13, 18, and 21, as well as 22q11.2 deletion which returned low risk. Serum alpha fetoprotein returned elevated at 943.2 ng/mL, which supported the diagnosis of PMD. Her pregnancy was followed by serial growth ultrasounds, which initially showed reassuring fetal growth between the 16th and the 36th percentile for gestational age. Twice weekly fetal testing was started at 28 weeks gestation secondary to PMD. At 30 weeks gestation, the patient presented with symptoms of preeclampsia, and a follow-up growth ultrasound showed fetal growth restriction at 4.4% with thickened ventricular walls, pericardial effusion, and echogenic bowel. Umbilical artery Doppler evaluation was normal. She ultimately required delivery by primary cesarean section later that day for recurrent spontaneous decelerations on electronic fetal monitoring.

At birth, the neonate weighed 1,245 grams, placing him in the 22nd percentile on the Fenton preterm growth chart.[3] He was admitted to the intensive care unit for prematurity and later diagnosed with a hepatic mesenchymal hamartoma. The diagnosis was made following an abdominal ultrasound, performed after a neonatal echocardiogram revealed a cyst-like structure in the liver. Prior prenatal ultrasounds showed no evidence of hepatic pathology. The cyst-like structure was serially monitored and developed into a classic hepatic mesenchymal hamartoma (shown in Figure 2). Given the findings, testing for BWS was ordered. Comprehensive analysis, including an 11p methylation study, multi-site imprinting evaluation, and CDKN1C sequencing, returned negative. However, the neonate's clinical course was complicated by persistent hypoglycemic events, as well as the postnatal development of left lower extremity hemihyperplasia, an umbilical hernia, nephromegaly, bilateral ear creases, and periorbital creases, leading to a clinical diagnosis of BWS. The hepatic mesenchymal hamartoma was successfully surgically resected at 17 weeks of age.

Figure 1. Ultrasonography at 24 weeks gestation showing cystic placentomegaly consistent with placental mesenchymal dysplasia.

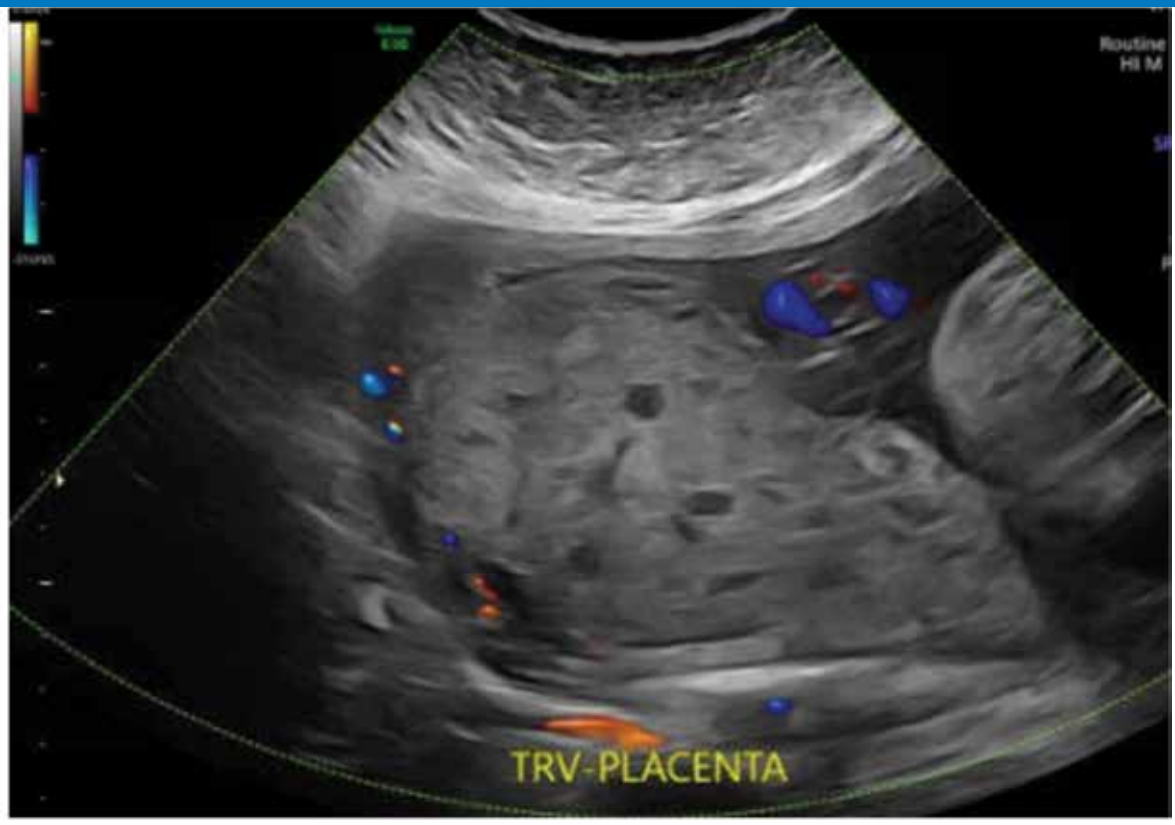
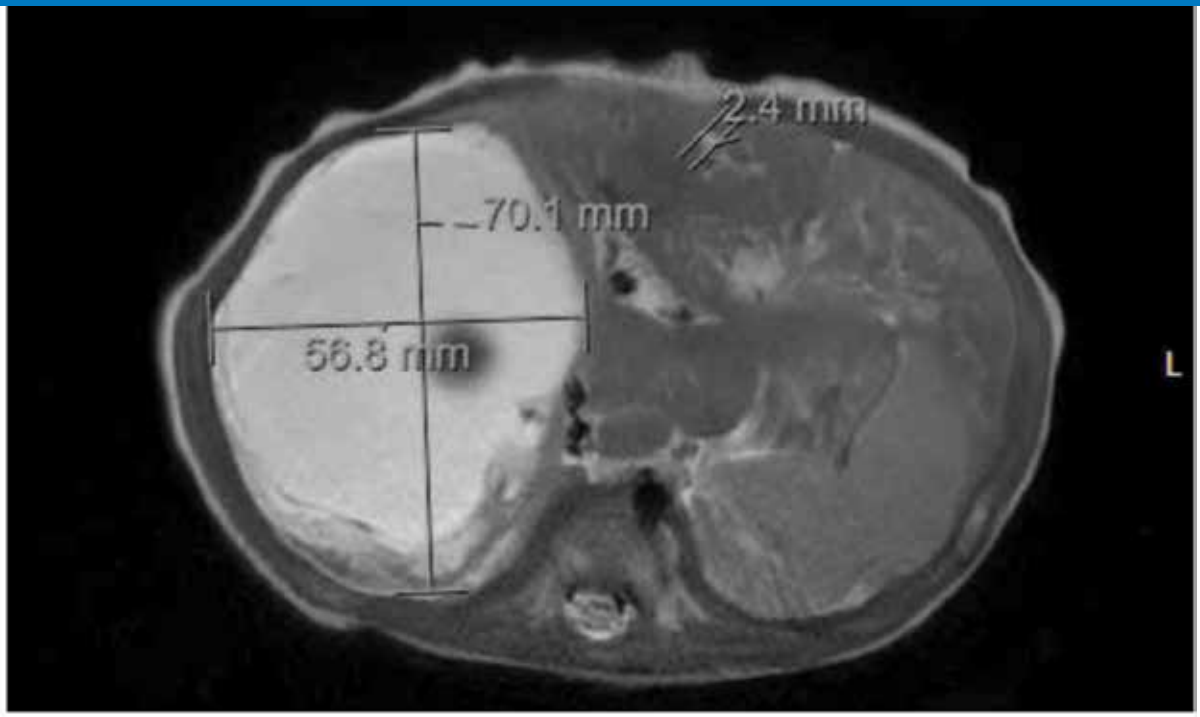


Figure 2. Neonatal hepatic mesenchymal hamartoma measuring 7.0 x 5.7 x 8.0 cm on MRI 60 days following birth.



Discussion

PMD was first defined in 1991 as mesenchymal hyperplasia of the stem villi in the placenta.[4] The sonographic appearance of PMD, characterized by dilated chorionic plate vessels, thrombosis of dilated vessels, and large grapelike vesicles, is similar to findings of a hydatidiform mole, leading to frequent misdiagnoses.[5] PMD, however, occurs alongside a viable fetus. Although no clear criteria exist for diagnosing PMD, an elevated AFP supports the diagnosis, as it occurs in 70-80% of cases.[1] PMD is associated with a variety of prenatal complications, including fetal growth restriction, preeclampsia, eclampsia, syndrome of hemolysis, elevated liver enzymes, and low platelet count (HELLP syndrome), preterm delivery, and stillbirth.[4] It is estimated that 20% of fetuses in pregnancies with PMD have BWS.[1] While both hepatic mesenchymal hamartoma and PMD are associated with BWS, there are only a few reported cases of hepatic mesenchymal hamartomas associated with placental mesenchymal dysplasia with varying outcomes.[6-12]

BWS affects 1 in 10,340 live births and is characterized by a genetic overgrowth disorder associated with a large range of symptoms, including hemihyperplasia, macroglossia, neonatal hypoglycemia, visceromegaly, and increased risk of tumors.[2] It is frequently associated with changes in the regulation of chromosome 11p15.5 region.[2] Various genetic mechanisms are implicated in BWS, including duplications, deletions, abnormal DNA methylation, uniparental disomy, specific gene mutations in CDKN1c, and altered expression of the IGF-2 gene.[2] CDKN1C is a maternally imprinted gene that acts as a growth suppressor. However, as in our case, a molecular diagnosis cannot be made in 20% of patients, and in such cases, a diagnosis is made based on clinical findings.[2] A clinical diagnosis of BWS can be made using a scoring system where a total score of 4 is sufficient. 'Cardinal Features' (2 points each) include macroglossia, exomphalos, lateralized overgrowth, multifocal or bilateral Wilms tumors, hyperinsulinism, and pathology findings including adrenal cortex cytomegaly, PMD, or pancreatic adenomatosis.[2] 'Suggestive Features' (1 point each) include birthweight > 2 standard deviations above the mean, facial nevus simplex, polyhydramnios and/or placentomegaly, ear creases and/or pits, transient hypoglycemia, typical BWS associated tumors, nephromegaly and/or hepatomegaly, and umbilical hernia and/or diastasis recti.[2] Most cases of BWS are sporadic, although familial cases can occur.[2]

Hepatic mesenchymal hamartomas are the second most common benign liver tumor in infants, comprising 8% of all pediatric liver tumors.[7] They are composed of loose mesenchymal tissue, connective tissue, bile ducts, and hepatocytes and may also include cysts and areas of degeneration.[13] Although diagnosis is often made following delivery, there have been 24 previous case reports of diagnosis of hepatic mesenchymal hamartoma by prenatal ultrasonography, and 9 of these cases were also associated with placental abnormalities.[13] Outcomes are favorable if identified, and resection is possible; however, hepatic mesenchymal hamartomas have also been associated with fetal demise, and few have required whole liver transplants postnatally.[12,13] Although benign, hepatic mesenchymal hamartomas can become problematic if growth leads to compression of the liver itself or the upper gastrointestinal tract, leading to polyhydramnios.[13] It can also lead to compression of the inferior vena cava and umbilical vein, leading to congestive heart failure.[13]

The relationship between PMD and BWS and the potential concurrent occurrence with a hepatic mesenchymal hamartoma underscores the necessity for a thorough approach to prenatal and postnatal diagnosis and management. As evident in our case, further fetal findings of BWS may not be apparent on the initial prenatal diagnosis of PMD, which accentuates the importance of continued close surveillance throughout pregnancy. Given the association with fetal demise and other pregnancy complications, patients presenting with PMD should be offered antenatal testing and follow-up ultrasounds to detect the potential development of patterns of overgrowth. A multidisciplinary approach involving medical genetics, neonatology, and maternal-fetal medicine was essential in ensuring the safe delivery of our patient and facilitating the neonate's subsequent evaluation and appropriate care.

REFERENCES

1. Soejima H, Hara S, Ohba T, Higashimoto K. Placental mesenchymal dysplasia and Beckwith Wiedemann Syndrome. Cancers. 2022;14:5563.
2. Brioude F, Kalish JM, Mussa A, et al. Expert consensus document: Clinical and molecular diagnosis, screening and management of Beckwith-Wiedemann Syndrome: an international consensus statement. Nat Rev Endocrinol. 2018;14:229-49.
3. Fenton TR, Kim JH. A systematic review and meta-analysis to revise the Fenton growth chart for preterm infants. BMC Pediatrics. 2013;13:59.
4. Mehedintu C, Frincu F, Ionescu OM, et al. A challenging diagnosis: placental mesenchymal dysplasia-literature review and case report. Diagnostics. 2022;12:293.
5. Tang P, Jin X, Li J, Zhang L, Li Y, Xu S. Misdiagnosis of placental mesenchymal dysplasia as pregnancy with hydatidiform mole: a case report and literature review. Medicine. 2023;102:e33438.
6. Francis B, Hallam L, Kecskes Z, Ellwood D, Croaker D, Kent A. Placental mesenchymal dysplasia associated with hepatic mesenchymal hamartoma in the newborn. Pediatr Dev Pathol. 2007;10:50-4.

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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Advanced Care for Children in All Stages of Heart Failure

Content submitted by Children's Nebraska

The Advanced Pediatric Heart Failure & Transplant Program at Children's Nebraska received full approval from the Centers for Medicare and Medicaid Services in November 2024, is active in the United Network for Organ Sharing system and is actively listing patients for heart transplantation. Led by surgical director Camille Hancock Friesen, MD, and medical director Jason Cole, MD, the program provides comprehensive care for children with heart failure, serving patient families in the region and beyond.

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Recently, Children's Advanced Pediatric Heart Failure & Transplant team performed its first-ever placement of a durable mechanical circulatory support in the form of ventricular assist device (VAD), a significant milestone. The life-saving device can serve as a bridge to heart transplantation or, in some cases, act as a long-term solution for children with heart failure. The ability to offer VAD implantations is a testament to Children's commitment to providing the most advanced pediatric cardiac care.

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Anastomotic Leak of Colon Successfully Treated With Double Pig Tail Stent Placed Endoscopically: Literature Review and Case Report

Sena Uzunlar, MD; and Alexander Haitham Turaihi, MD, PhD

Abstract

Anastomotic leakage after colorectal surgery is a serious complication , leading to higher morbidity and mortality, permanent stoma formation, and cancer recurrence. Management of anastomotic leaks is patient-specific and surgical management is dictated by the degree of contamination, inflammation, and patient risk factors. Internal drainage with double pigtail stents – initially used for managing leaks after bariatric surgery – has recently been applied to anastomotic leaks following resection of colorectal malignancies. Herein we report the case of a 65-year-old male with a history of sigmoid resection and colosostomy with subsequent ostomy takedown who presented for follow-up. Imaging at this visit showed concern for possible anastomotic leak at the ostomy takedown site. Further endoscopic investigation revealed a small area of anastomotic dehiscence which was therapeutically addressed with stent placement. The patient later presented with concerns of stent migration confirmed with imaging. A larger caliber secondary stent was then successfully placed, and placement and therapeutic effect were confirmed at follow-up. This paper aims to highlight the role of endoscopic management of colorectal anastomotic leak.

Introduction

Anastomotic leakage is the most feared complication after intestinal surgery, occurring in 2.9% to 15.3% of cases, and contributes to a significant proportion of postoperative mortality in colorectal surgery, accounting for up to one-third of deaths.[1] Despite its seriousness, there remains no universally accepted definition of an anastomotic leak, complicating efforts to standardize diagnosis and treatment.[2] Leakage rates differ based on the location of the anastomosis, with intraperitoneal anastomoses having lower leakage rates compared to extraperitoneal ones. Risk factors for anastomotic leakage include male gender, previous abdominal surgery, Crohn's disease, rectal cancer close to the anal verge, higher ASA (American Society of Anesthesiologists) classification, and prolonged operative time.[1]

Early diagnosis is critical to managing anastomotic leaks. Clinical signs, such as free air in the abdomen, fecal discharge, or pelvic abscess formation, typically prompt further investigation through water-soluble enemas or CT scans. However, leaks are often diagnosed late – sometimes after hospital discharge.[1] The management of acute anastomotic leaks after colorectal surgery requires careful decision-making based on patient stability and intraoperative findings. Stable patients without systemic infection may be treated nonoperatively with antibiotics and bowel rest, often with percutaneous drainage if fluid collections are present. Small, contained leaks can be managed with antibiotics alone, while larger abscesses (>3 cm) require drainage. Surgical intervention is necessary for patients with generalized peritonitis, septic shock, or those unresponsive to conservative treatment. Options include drainage with proximal diversion, resection with end-stoma creation, or revision of the anastomosis with diversion, depending on the patient's condition and degree of contamination. Newer treatments include stenting, vacuum-assisted rectal drainage, and endoscopic clipping with the ultimate goal of minimizing morbidity.[3]

Endoscopic internal drainage (EID) can treat fluid collections around anastomotic leaks. Techniques like double pigtail stent placement allow drainage into the GI lumen, promoting healing by preventing abscess formation. Placing a stent over an anastomotic leak serves to seal the defect and redirect GI luminal contents, facilitating healing. For large defects, combining a pigtail catheter with a stent placement is effective. The stent seals the anastomosis opening, while the pigtail catheter drains the collection towards the lumen.

For colon anastomoses dehiscence, stents are typically used only in end-to-end anastomoses. One of the potential complications of stent placement is stent migration.[4]

While not without risk of complication, endoscopic internal drainage provides a less invasive yet effective treatment modality in managing postoperative anastomotic leak. This procedure is especially effective with early diagnosis if the leak in clinically stable patients.

Case Presentation

This case describes a 65-year-old male with a history of metastatic colon cancer post-chemotherapy, sigmoid resection and ostomy, and one month post operation for ostomy takedown who presented to the emergency department after CT during a follow up oncology visit showed concern for an abscess and possible anastomotic leak in the left lower quadrant near the ostomy takedown site (Figure 1). He was started on IV antibiotics after abscess cultures were obtained, and general surgery was consulted for further management. At this time, the patient reported gas coming out of the ostomy wound as well as feculent drainage prompting concern of wound fistulation. Overnight, there was an increase in drainage from the ostomy takedown site further enhancing clinical suspicion of fistula formation. The patient then underwent a colonoscopy to assess for a fistula as well as possible stent placement.

During the procedure, a flexible EGD scope was passed through the rectum. The colorectal anastomosis was visualized and traversed to the mid descending colon. As the scope was pulled back, the anastomosis was inspected and appeared to be intact except for an estimated 25% dehiscence of the anastomosis at one corner. The scope was passed through the dehiscence into a chronic abscess cavity consistent with a cavity noted on the preoperative CT scan. The endoscope was removed from the rectum and exchanged with a therapeutic EGD scope, under direct vision a wire was passed through the anastomotic dehiscence into the abscess cavity and wire position was fluoroscopically confirmed. A 10 French 7cm double pigtail biliary stent was inserted over the guide wire and placed across the anastomotic dehiscence (Figure 2). Endoscopic evaluation of the anastomosis and the stent confirmed satisfactory position of the stent and the anastomosis.

CT on post-procedure day one demonstrated appropriate placement of the stent with decreased size of the fluid

Figure 1. CT taken at presentation depicting postop changes of colostomy takedown with perianastomotic abscess (blue arrow) extending into the subcutaneous soft tissues of the left lower quadrant ostomy takedown site (red arrows) as well as pneumoperitoneum suggestive of active leak, possibly also arising from the colonic anastomotic site.

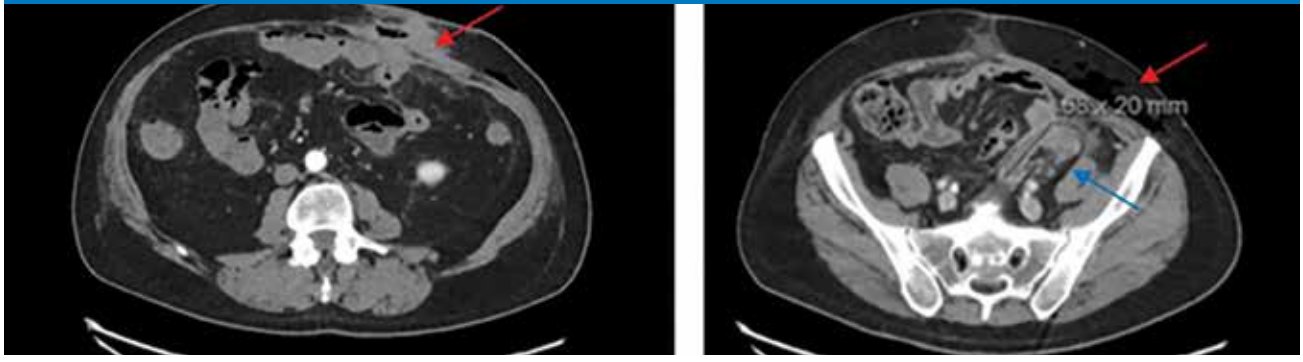


Figure 2. 10 French 7 cm double pigtail biliary stent placed across the anastomotic dehiscence.

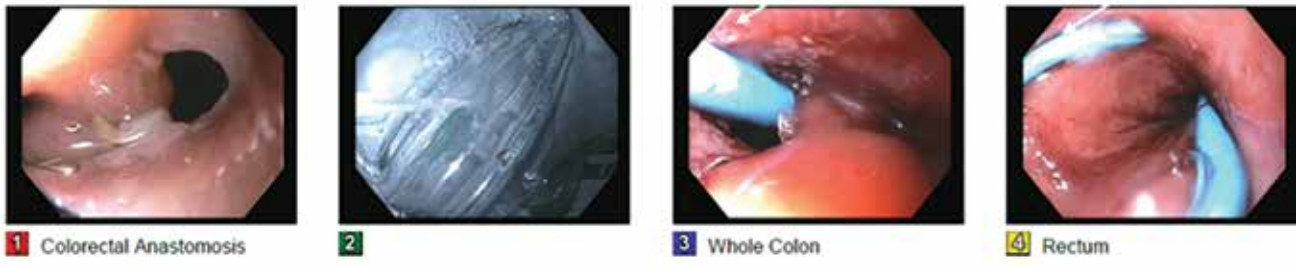


Figure 3. CT on post-operative day one demonstrating appropriate placement of the stent with decreased size of the fluid collection.

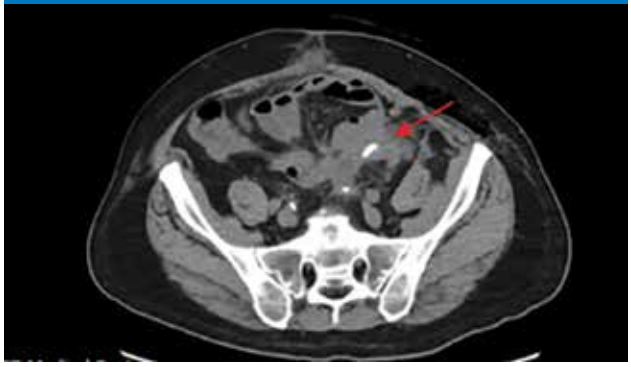


Figure 4. Rectosigmoid stent no longer identified on CT.

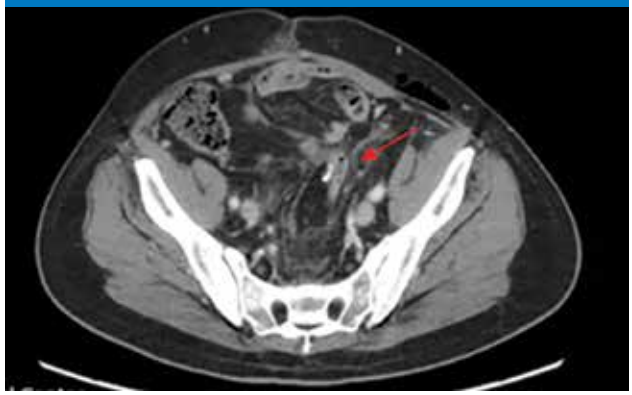
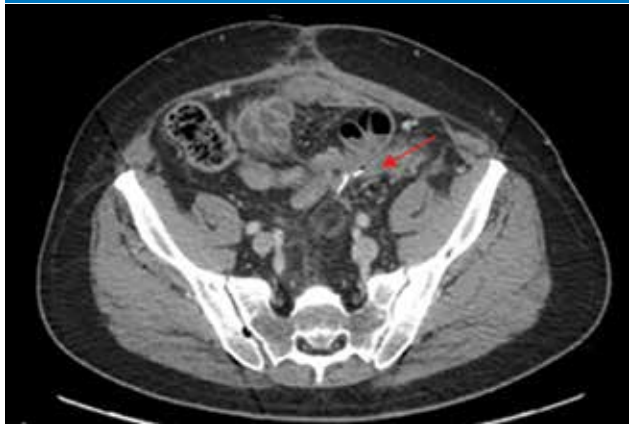


Figure 5. 7 French double pig tail biliary stent was placed across the anastomotic leak.

collection (Figure 3). Soon after stent placement, the feculent material that had been previously coming from his former ostomy wound takedown site slowed significantly. He continued to improve clinically until he was cleared for discharge on post-procedure day three in stable condition.

On post-procedure day five, he presented back to the emergency department with concerns that his stent had fallen out. At this time, he noted that he was having increased air and drainage from his previous colostomy site. CT of the abdomen revealed that the previously seen rectosigmoid stent was no longer identified (Figure 4). The perianastomotic fluid and gas containing collection that the stent was previously draining was stable in size. Surgery was then consulted for evaluation of the dislodged stent. A flexible sigmoidoscopy was performed and again revealed the end-to-end anastomosis is the proximal rectum with the same level of dehiscence. A 7 Fr double pig tail biliary stent was placed across the leak. The patient was discharged and continued to have an unremarkable post procedure course (Figure 5). The patient was discharged on oral antibiotics. CT performed at one-week follow-up appointment confirmed stent placement and noted that the previously seen air and

Figure 6. CT at one-week follow-up confirmed decrease in size of previously seen enterocutaneous fistula tract.



fluid collection indicating the enterocutaneous fistula tract had decreased in size.

Discussion

Postoperative complications after colorectal surgery are linked to higher mortality, poorer oncologic outcomes, and reduced quality of life.[5] Postoperative complications affect up to one-third of patients undergoing colorectal procedures. For

example, Longo et al. reported a 28% complication rate in patients undergoing colectomy for colon cancer.[6] Common complications include infections and gastrointestinal motility issues. Wound complications, including dehiscence, occur in up to 13% of patients after colorectal surgery. Anastomotic leaks or organ space infections occur in 3-10% of cases and are responsible for 32% of reoperations in colorectal cancer patients.[5]

Anastomotic leaks from colorectal surgery are associated with increased mortality and longer hospital stays. EID with double-pigtail (DPT) stents has been effectively used to manage leaks and fistulas following gastrointestinal surgeries. This technique, initially successful for pancreatic pseudocysts, is now applied to both upper and lower GI leaks. The stents act as foreign bodies, promoting tissue healing around the leak and aiding in reepithelialization. EID allows for less invasive management of anastomotic leak and fluid collection. The DPT stents help in drainage, avoid general anesthesia, require fewer repeated endoscopic procedures, and allow for earlier oral feedings thus supporting better nutritional status and mobility while potentially reducing hospital stay and other complications.

Overall, the use of endoscopic stenting in treatment of anastomotic leak is promising. However, the use of stenting is not without limitation. Endoscopic drainage may not be effective in cases of uncontained leaks, generalized peritonitis, or certain complications like neoplasia, distal obstruction, or other undrained septic foci. Issues such as high fluid output, foreign bodies, radiation, and poor nutrition can also affect healing. Complications may arise with the use of endoscopic stenting and a major limitation in the use of stents is their propensity for migration. When used for treatment of GI leaks, stent migration occurs in at least 25% of patients.[7] This complication is especially prevalent in the lower GI tract. The increased motility of the lower GI tract can lead to easy migration of stents both forward and backward. This migration can hinder the closure of fistulas and raise the risk of complications such as obstruction, perforation, and other issues related to stent movement.

Conclusion

Anastomotic leakage remains a formidable challenge in colorectal surgery, often leading to increased morbidity, prolonged hospital stays, and elevated mortality rates. The case presented demonstrates the potential of endoscopic techniques, particularly the use of double-pigtail stents, to effectively manage anastomotic leaks. The successful application of these stents in treating a 65-year-old male with an anastomotic dehiscence highlights their role in facilitating healing and reducing the need for more invasive procedures.

Despite the promising results, the limitations of endoscopic stenting, including the risk of stent migration, underscore the need for careful patient selection and ongoing evaluation. The migration of stents, particularly in the lower gastrointestinal tract, poses significant challenges and may impact the overall efficacy of the treatment. Thus, while endoscopic internal drainage offers a valuable alternative to traditional surgical interventions, it is essential to consider its limitations and incorporate it within a comprehensive management strategy.

Continued research and refinement of endoscopic techniques are crucial to overcoming these challenges and improving patient outcomes. The integration of stenting into standard practice for managing anastomotic leaks could potentially enhance recovery, reduce hospital stays, and optimize overall care for colorectal surgery patients. As the field advances, a multidisciplinary approach and individualized treatment plans will be key to addressing the complexities of anastomotic leakage and improving surgical outcomes.

REFERENCES

1. Kirchhoff P, Clavien PA, Hahnloser D. Complications in colorectal surgery: risk factors and preventive strategies. Patient Saf Surg. 2010;4(1):5.
2. Saur NM, Paulson EC. Operative management of anastomotic leaks after colorectal surgery. Clin Colon Rectal Surg. 2019;32(3):190-5.
3. Hedrick TL, Kane W. Management of acute anastomotic leaks. Clin Colon Rectal Surg. 2021;34(6):400-5.
4. Menni A, Stavrou G, Tzikos G, Shrewsbury AD, Kotzampassi K. Endoscopic salvage of gastrointestinal anastomosis leaks—past, present, and future—a narrated review. Gastrointest Disord. 2023;5(3):383-407.
5. Tevis SE, Kennedy GD. Postoperative complications: looking forward to a safer future. Clin Colon Rectal Surg. 2016;29(3):246-252. doi:10.1055/s-0036-1584501
6. Longo WE, Virgo KS, Johnson FE, et al. Risk factors for morbidity and mortality after colectomy for colon cancer. Dis Colon Rectum. 2000;43(1):83-91. doi:10.1007/BF02237249
7. Willingham FF, Buscaglia JM. Endoscopic management of gastrointestinal leaks and fistulae. Clin Gastroenterol Hepatol. 2015;13(10):1714-21.

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Endoscopic Treatment of Iatrogenic Colon Perforation: Literature Review and Case Report

Sena Uzunlar, MD; and Alexander Haitham Turaihi, MD, PhD

Abstract

Colonoscopic perforation is a severe but rare complication of lower gastrointestinal endoscopies, linked to high morbidity and mortality rates. Iatrogenic perforation during colonoscopy can lead to serious outcomes including extended hospital stays, need for surgical intervention, intra-abdominal sepsis, or death. While perforations have traditionally required surgical or interventional radiology management, use of over-the-scope clipping has offered the option of endoscopic management. Herein we report the case of a 79-year-old woman who presented with concern for colonic perforation after endoscopic polypectomy. Colonic perforation was detected at a follow up colonoscopy. Further investigation with CT revealed findings of perforation with pneumoperitoneum. Repeat colonoscopy was performed revealing the perforation in the distal colon. During the procedure, hemostatic over-the-scope clips were placed, and the defect was successfully closed. This paper aims to highlight the incidence of perforation during colonoscopy and to discuss the role endoscopic management in bowel perforation.

Introduction

Colonic perforation (CP) occurs in 0.016% to 0.2% of diagnostic colonoscopies, but the rate can rise to 5% for certain therapeutic procedures. During colonoscopy, minor mucosal damage is common and usually has no significant clinical impact beyond minor bleeding. More serious injuries include barotrauma leading to colon perforation, particularly in the cecum due to its thin wall and potential for closed-loop obstruction. Mechanical lacerations can happen with improper technique or forceful manipulation.[1] The risk of CP is significantly higher in therapeutic colonoscopies compared to diagnostic ones and is most common in the rectosigmoid colon due to anatomical and physiological factors, including sharp angulations and the colon's mobility. Elderly patients and those with multiple comorbidities are at increased risk due to decreased colon wall strength. Other factors include a history of diverticular disease, prior abdominal surgery, and female gender.[2] CP secondary to colonoscopy may present with symptoms of peritonitis shortly following the procedure. CP from therapeutic colonoscopies, i.e. polypectomies, may present with smaller perforations and have a delayed diagnosis compared to diagnostic colonoscopies.[2]

Initial assessment for suspicion of a perforation may start with abdominal plain films to check for intraperitoneal free air which would indicate perforation. CT scans are valuable for evaluating the extent of the perforation. However, symptoms like fever, abdominal pain, or distention occurring days after the procedure warrant suspicion of CP, even in the absence of immediate radiologic findings.[3] Management for colonic perforation ranges from conservative to operative treatment. For patients in good condition without signs of severe peritonitis, treatment involves bowel rest, antibiotics, and monitoring. This approach has a success rate of 33% to 73% and can be utilized for small, sealed off perforations in clinically stable patients. Endoscopic repair is usually suitable for smaller perforations, especially if the perforation is identified during the procedure.[1-3] Success rates vary but can reach up to 93% with early intervention.[2] For more severe cases involving diffuse peritonitis or significant colonic pathology, operative treatment may be required which includes simple closure of the perforation or partial bowel resection.[1,2]

Endoscopic treatment techniques are useful if the perforation is recognized during the procedure or in the peri-procedure period. Techniques involve endoscopic clipping for small perforations smaller than 1cm. For larger defects, through-the scope or over-the-scope clips can be used. However, if endoscopic treatment fails or if there is ongoing leakage or peritonitis, surgical intervention is indicated.[1,3]

Case Presentation

This case describes a 79-year-old female with a past medical history of polymyalgia rheumatica on leflunomide, mucinous cystadenoma ovary, seizure, depression, osteoporosis,

Figure 1. Perforation in distal sigmoid colon visualized during colonoscopy.

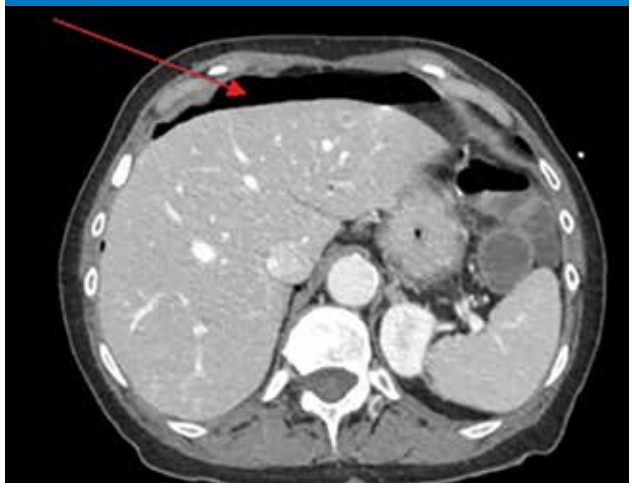
restless legs, and hypertension and past surgical history of tubal ligation and a robotic hysterectomy. She presented to the emergency department after concern for perforation following colonoscopy. General surgery was consulted.

An initial colonoscopy three months prior revealed a 20 mm polyp and a 12 mm polyp in the cecum. These polyps were removed with endoscopic mucosal resection. Pathology for both polyps showed a sessile serrated adenoma with at least high-grade dysplasia and focus suspicious for invasion as well as a tubular adenoma in the transverse colon. She was scheduled for repeat colonoscopy for re-evaluation of the lesions. During the follow-up colonoscopy, the scope was advanced to the sigmoid colon where a perforation was found (Figure 1). The area was tattooed before the procedure was aborted.

At the time of general surgery consultation, the patient was afebrile and hemodynamically stable. On exam, her abdomen was soft and non-distended with very minimal tenderness in the left lower quadrant. CT scan was obtained which confirmed findings of perforation with pneumoperitoneum and small volume ascites (Figure 2). These findings were discussed with GI and a repeat colonoscopy with fluoroscopy was planned to re-evaluate the lesion and intervene endoscopically if possible. If unsuccessful, surgical intervention would be considered.

The repeat colonoscopy revealed a 15 mm perforation in the distal sigmoid colon, proximal to the previously placed tattoo. The defect was successfully repaired with reapproximating of the wound edges and placement of three hemostatic clips. (Figure 3) There was no bleeding during, or at the end, of the procedure. Contrast was injected under endoscopic and fluoroscopic guidance revealing no evidence of extravasation.

Figure 2. CT depicting features compatible with bowel perforation including pneumoperitoneum and small volume ascites.

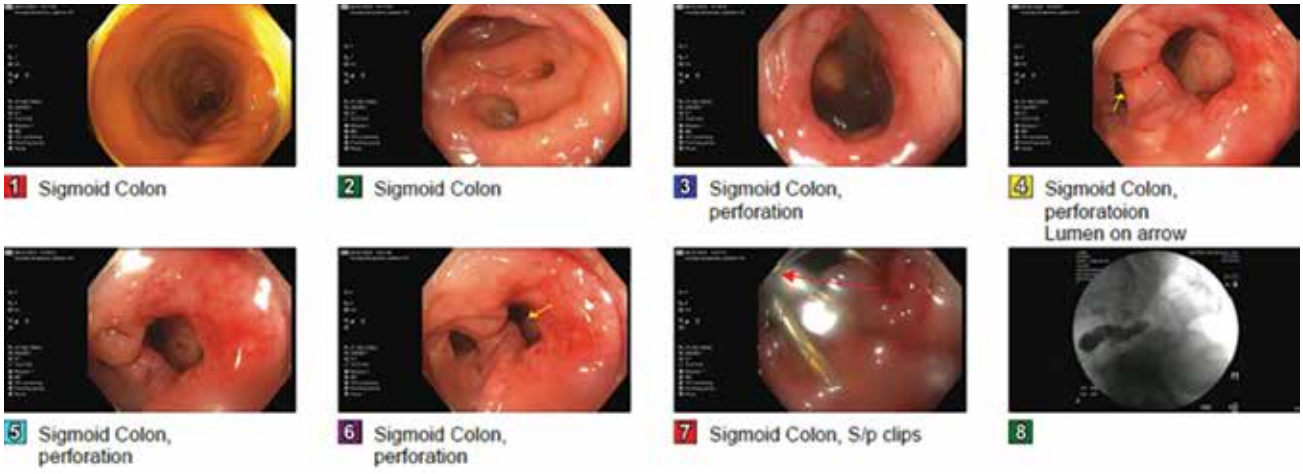


The patient was admitted to surgery for observation and serial abdominal exams. She did very well after the procedure with reassuring serial abdominal exams and continued to improve clinically until she was cleared for discharge post-procedure day two in a stable condition.

Discussion

Through-the-scope clips have been used in interventional endoscopy for managing colonic perforations and bleeding, but their effectiveness is generally limited to small defects under 2 cm. Recently, over-the-scope (OTS) clips, were developed for more complex procedures like full-thickness resections and natural orifice transluminal endoscopic surgery OTS clips have shown higher efficacy than through-the-scope (TTS) clips for closing larger defects, including in cases of bleeding and perforations, primarily in the upper gastrointestinal tract. However, data on their use in the colon is limited and often comes from specialized centers with small

Figure 3. Endoscopic closure of colon perforation with hemostatic clips.



sample sizes, which may not reflect broader clinical reality.

A 2019 study identified cases involving OTS clips through specific administrative codes and analyzed the use of OTS clips in management of perforation due to different etiologies including perforations during colonoscopy, polypectomy complications, and colonic bleeding. Polypectomy was the primary reason for using OTS clips, with 62.4% of cases involving this procedure.[4]

OTS clips are effective for closing perforations, particularly when criteria for deployment, including access and tissue condition, are met. Access requires that the device can reach the perforation site. Strictures or significant looping in the colon may prevent successful deployment. Techniques like balloon dilation for stenosis can help in mitigating complications while attempting to reach the area. The tissue must be pliable enough to be captured by the OTS clip cap. Tissue that is fibrotic, scarred, ulcerated, or macerated may not be suitable. For this reason, early intervention is preferred as it increases the likelihood of success by reducing tissue damage and improving approximation.

While OTS clips used in perforations and bleeding is promising, their use is not without risks. Evaluating OTS clip outcomes is challenging due to a lack of large-scale randomized controlled trials. However, ongoing studies, such as the FISCLOSE trial led by Dubois et al., aim to compare OTS clips with other methods like rectal mucosal advancement flaps for complex anal fistulas.[5] Kobara et al. Analyzed 1,517 cases across 30 studies. OTS clips showed an overall success rate of 78%, with an 85% success for perforations.[6] Several complications of OTS clips have been reported in the literature such as clip dislodgement, OTS clip detachment due to scar tissue and a case where OTS clip deployment led to necrosis at the anastomosis site.[5,7]

Conclusion

In summary, colonoscopic perforation is a rare but severe complication of lower gastrointestinal endoscopies, often leading to significant morbidity and mortality. The case presented in this article highlights the potential of endoscopic management for colonic perforations, particularly through the use of over-the-scope (OTS) clips. This technique offers a viable alternative to traditional surgical approaches, especially for smaller defects detected early. The successful application of OTS clips in this case underscores their potential effectiveness in managing perforations, though their use is not without risks and challenges. Continued research and advancements in endoscopic techniques are crucial for improving outcomes and expanding the role of endoscopic interventions in complex cases of colonic perforation.

REFERENCES

1. Thompson EV, Snyder JR. Recognition and management of colonic perforation following endoscopy. Clin Colon Rectal Surg. 2019;32(3):183-9.
2. Lohsiriwat V. Colonoscopic perforation: incidence, risk factors, management and outcome. World J Gastroenterol WJG. 2010;16(4):425-30.
3. de'Angelis N, Di Saverio S, Chiara O, et al. 2017 WSES guidelines for the management of iatrogenic colonoscopy perforation. World J Emerg Surg. 2018;13(1):5.
4. Horenkamp-Sonntag D, Liebentraut J, Engel S, et al. Use of over-the-scope clips in the colon in clinical practice: results from a German administrative database. Endoscopy. 2020;52(12):1103-10.
5. Wei MT, Ahn JY, Friedland S. Over-the-scope clip in the treatment of gastrointestinal leaks and perforations. Clin Endosc. 2021;54(6):798-804.
6. Fujihara S, Mori H, Kobara H, et al. The efficacy and safety of prophylactic closure for a large mucosal defect after colorectal endoscopic submucosal dissection. Oncol Rep. 2013;30(1):85-90.
7. Mercky P, Gonzalez JM, Aimore Bonin E, et al. Usefulness of over-the-scope clipping system for closing digestive fistulas. Dig Endosc Off J Jpn Gastroenterol Endosc Soc. 2015;27(1):18-24.

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The Development of Malignant Melanoma Concurrent to Encorafenib and Cetuximab Therapy for Gastrointestinal Cancer With Neuroendocrine Features

Alyssa L. Reinschmidt, MD; Kianna Thelen, MS IV; Samantha Halverson, BS; Karah White, MD; and Marcus L. Frohm, MD

Abstract

BRAF inhibitors, among other targeted therapies, have transformed the treatment of many cancers in recent years. While cutaneous malignancies are a known adverse effect of BRAF inhibitors, the following case description highlights the importance of regularly monitoring patients on these therapies for new or changing skin lesions. A female in her 70s presented to the dermatology clinic with the sudden development of several new, dark nevi one month after the initiation of encorafenib with cetuximab for neuroendocrine carcinoma. Biopsy results were positive for a superficial spreading melanoma and a separate lesion demonstrating severe histologic atypia. Procedural dermatology performed a complete excision of both lesions.

Introduction

Advancements in genomic sequencing, in conjunction with the development of targeted therapies, have revolutionized the treatment of many cancers in recent years. BRAF V600E mutation was first described in 2002 and has since become an established driving force of cellular proliferation identified in a significant proportion of cutaneous melanoma cases.[1] Supporting studies have found the frequency of BRAF mutations in 40-60% of melanoma cases.[2]

BRAF is part of the mitogen-activated protein kinase (MAPK) pathway. The BRAF V600E mutation results in higher kinase activity, leading to constant activation of the downstream MEK/ERK pathway.[1] This increases cell proliferation, influx of tumor cells, and accelerated metastasis.[1] Vemurafenib was the first FDA-approved BRAF inhibitor for the treatment of metastatic melanoma and improved overall survival for patients.[3] With more recently approved BRAF and MEK inhibitors, treatment for metastatic melanoma has continued to evolve.[3]

Melanoma is not the only malignancy harboring BRAF V600E mutations; some lung, thyroid, neuroendocrine, and colorectal cancers have also been identified with this mutation.[4,5] BRAF V600E has also been studied as a therapeutic target in metastatic colorectal cancers (mCRC). BRAF inhibitor monotherapy was unsuccessful in treating mCRC, likely secondary to alternative MAPK pathway activation.[5] Thus, combination therapy, particularly with encorafenib and cetuximab, has been endorsed as the standard of care for BRAF V600E-mutated mCRC as the feedback loops that activate alternative MAPK pathways are also inhibited.[5]

BRAF inhibitors have altered oncologic treatment and ultimately improved survival and outcomes. However, essential side effects must be considered when choosing these therapies. It has been established that BRAF inhibitors can inflict many cutaneous adverse effects; in one study, vemurafenib was associated with rashes, photosensitivity, squamoproliferative growths, keratoacanthomas, and squamous cell carcinomas.[6] Tabernero et al. further investigated the adverse effects as reported by patients receiving encorafenib and cetuximab for the treatment of mCRC.[7] Common adverse effects were diarrhea, nausea, fatigue, and dermatitis acneiform.[7] Severe cutaneous side effects, though rare, included keratoacanthomas and malignant melanomas. The incidence of keratoacanthomas was 1%, while new melanomas were acknowledged in 2% of patients receiving encorafenib and cetuximab, warranting thorough dermatologic evaluations before, during, and after treatment.[7]

The following case describes the association of BRAF inhibitors with the development of malignant melanoma and numerous atypical nevi.

Case Description

A female in her 70s with a past medical history significant for appendiceal adenocarcinoma presented to the dermatology clinic in September of 2023 for a formal evaluation of new, concerning skin lesions.

This patient was diagnosed with appendiceal adenocarcinoma following suspicious findings during a routine screening colonoscopy in November 2022. The patient was treated at that time with capecitabine/oxaliplatin for one cycle of chemotherapy followed by seven cycles of capecitabine alone. Reimaging was completed in July 2023, and evidence of disease progression to the omentum and adenopathy was noted above the diaphragm. CT-guided biopsy revealed a poorly differentiated adenocarcinoma with neuroendocrine features.

Genomic testing revealed a BRAF V600E alteration. In August 2023, the patient was started on encorafenib and cetuximab. One month later, the patient presented to her oncology appointment and noted several dark nevi that had appeared on her chest, back, abdomen, and scalp (Figure 1). The patient was evaluated by a dermatology provider and had multiple biopsies completed for the new suspicious lesions. Histologic evaluation revealed one of the lesions to be superficial spreading melanoma arising in association with a nevus (Figure 1C); Breslow's thickness was 0.5 mm, with no other adverse histologic features (pathologic stage IA melanoma) (Figure 2). Immunohistochemical staining supported the diagnosis (Figure 3). Another nevus revealed severe histologic atypia (Figure 1B). The patient was then referred to procedural dermatology for excision of both lesions. Treatment with encorafenib and cetuximab was discontinued in November 2023. The patient was then started on carboplatin/etoposide and received one round of treatment. In December 2023, the patient expired secondary

Figure 1. A clinical photograph depicting eruptive nevi and superficial spreading melanoma on the upper back, taken in September 2023.

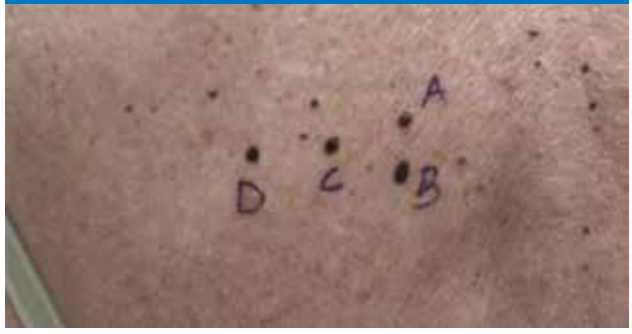
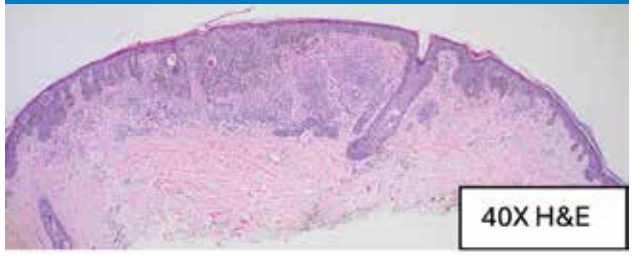


Figure 2. The H&E-stained sections demonstrate an atypical junctional melanocytic proliferation composed of bridging nests and singly distributed melanocytes with prominent nucleoli and amphophilic cytoplasm. Occasional small nests and single melanocytes are noted in the superficial dermis with similar morphologic features.



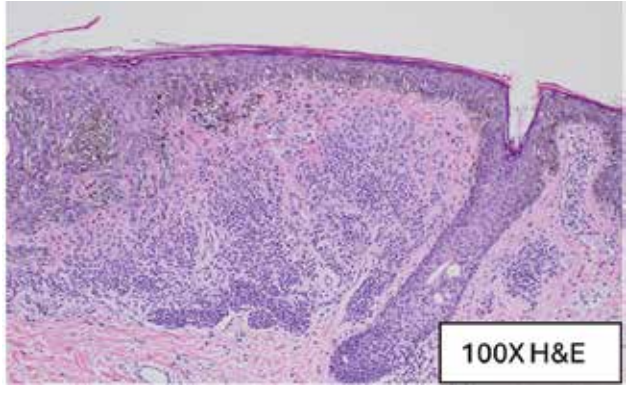
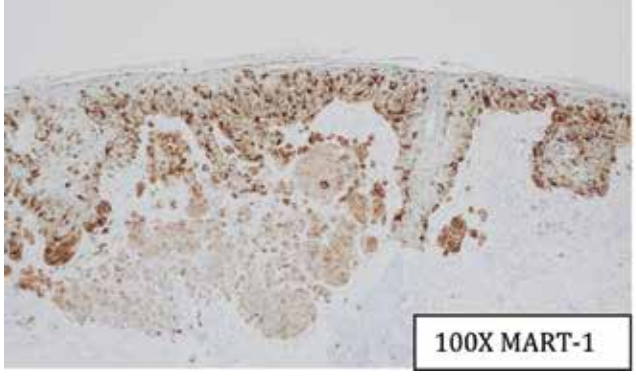
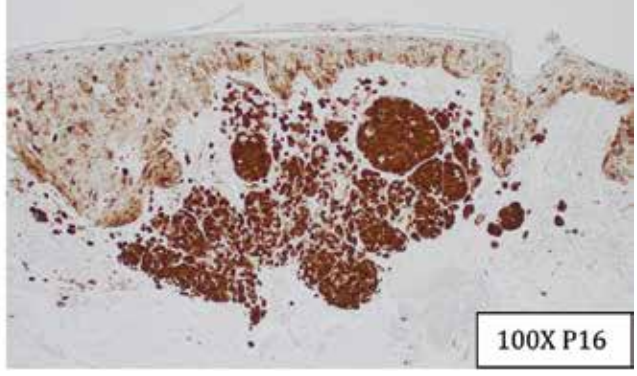


Figure 3. A MART-1 immunohistochemical stain reveals confluence of melanocytes along the dermal-epidermal junction with upward migration of melanocytes. A P16 stain demonstrates attenuated expression within the junctional melanocytes and is strongly preserved in the dermal nests.





to complications from her metastatic neuroendocrine adenocarcinoma.

Discussion

The case shines a light on the clinical course of a patient diagnosed with superficial spreading melanoma following treatment with encorafenib, an oral BRAF V600E inhibitor. Despite the goals for targeted therapy, the patient ultimately developed a secondary malignancy, which led to further investigation regarding the long-term safety profile of BRAF inhibitors.

The literature review revealed documented cases and clinical studies reporting secondary malignancies in patients receiving vemurafenib (BRAF inhibitor) therapy, including a retrospective analysis of 107 patients treated with vemurafenib.[6] The study documents that 41% of adverse skin-related effects in the patient population were squamous-proliferative growths, with 20% being squamous cell carcinoma (SCC) or keratoacanthoma (KA).[6] In addition, a prospective follow-up study of vemurafenib trials entailed twenty patients treated with the medication for 2-52 weeks.[8] Four patients presented with keratoacanthomas after 6-10 weeks, and two patients presented with SCC during the 10-16 week timeframe.[8] Additional findings in the literature have also cited an association between using vemurafenib for metastatic melanoma and the development of secondary melanomas. Dalle et al. reported the development of early melanoma in a total of five lesions on four patients who were currently being treated with vemurafenib.[9]

Previous case reports have noted the development of eruptive nevi following short-term treatment with encorafenib for BRAF-mutated malignancies. Meneguzzo et al. described a patient who developed multiple new nevi after two months of starting encorafenib and cetuximab for colorectal cancer, and some of the patient's pre-existing nevi were noted to have increased in size and darkened in color during this time.[10] Another case report presents a similar finding; a patient with metastatic melanoma with BRAF V600E positivity was initiated on encorafenib and, within two months, developed multiple eruptive nevi on his chest, back, and legs.[11]

Consistent with previous studies, the patient, in this case, developed the sudden onset of multiple new and changing cutaneous lesions, with one identified as early melanoma, necessitating prompt evaluation and management. The association between BRAF inhibitors and secondary malignancies has been well-documented, with studies suggesting an increased risk among patients treated with BRAF inhibitors.[11]

The pathophysiological mechanism underlying the development of secondary malignancies in patients receiving BRAF inhibitors is not fully understood. An article from the New England Journal of Medicine postulated that inhibiting mutated BRAF in cancer cells may concurrently activate the MAPK pathway by increasing phosphorylated ERK in surrounding keratinocytes with wild-type BRAF, leading to dysregulated proliferation and differentiation.[12] This paradoxical activation may explain the emergence of secondary malignancies, including squamous cell carcinoma and melanoma, in patients receiving these therapies. While direct data on encorafenib's impact on MAPK activation remains limited, this theory sheds light on the intricate interplay between targeted therapies and the tumor microenvironment, further emphasizing the need for continued investigation into the mechanisms driving treatment-related adverse events.

From a clinical perspective, our case underscores the importance of surveillance for developing lesions in patients treated with BRAF inhibitors. Given the established risk of secondary cutaneous malignancies associated with BRAF inhibitors, we recommend a structured approach to dermatologic surveillance for patients receiving encorafenib and cetuximab. Ideally, an initial in-depth skin examination should be performed before starting therapy to establish a baseline of existing nevi, skin lesions, and any areas of concern.[7] During therapy, clinical guidelines support the need for frequent dermatologic monitoring. According to the prescribing information for encorafenib, patients should undergo skin evaluations prior to initiating therapy, every two months during treatment, and for up to six months following the discontinuation of therapy due to the risk of developing new skin malignancies, including cutaneous squamous cell carcinoma and melanoma.[13] Additionally, eviQ, a clinical resource for cancer treatment protocols, recommends dermatologic evaluation monthly during the first 4-6 months of treatment, then every two months thereafter, continuing for six months after stopping the BRAF inhibitor.[14] These sources emphasize the need for vigilant, long-term dermatologic surveillance throughout and beyond encorafenib therapy.

While the findings of this specific case contribute to the growing body of evidence linking BRAF inhibitor therapy to secondary melanomas, several limitations should be considered. Like most retrospective case reports, our analysis is subject to selection bias and confounding factors.

Furthermore, the small sample size precludes definitive conclusions regarding this adverse event's prevalence and risk factors. Prospective studies with larger patient cohorts are needed to validate our findings and confirm the underlying mechanisms driving treatment-related carcinogenesis.

Conclusion

In conclusion, our case emphasizes the importance of ongoing vigilance and monitoring for developing secondary melanomas in patients undergoing BRAF inhibitor therapy. Despite the remarkable efficacy in targeting mutant BRAF-driven tumors, this targeted therapy is associated with safety concerns, necessitating a mindful approach to patient management. By raising awareness of this potential complication and emphasizing the need for collaborative multidisciplinary care, we aim to optimize the therapeutic outcomes and quality of life for patients undergoing targeted therapy for advanced malignancies.

REFERENCES

1. Florent L, et al. Braf V600-Mutated Metastatic Melanoma and Targeted Therapy Resistance: An Update of the Current Knowledge. MDPI, Multidisciplinary Digital Publishing Institute, May 2023. Retrieved from www.mdpi.com/2072-6694/15/9/2607.
2. Lazaroff J, Bolotin D. targeted therapy and immunotherapy in melanoma. Dermatol Clin. 2023;41(1):65-77.
3. Chapman PB, Robert C, Larkin J, et al. Vemurafenib in patients with BRAFV600 mutation-positive metastatic melanoma: final overall survival results of the randomized BRIM-3 study. Ann Oncol. 2017;28(10):2581-87.
4. Burkart J, Owen D, Shah MH, et al. Targeting BRAF mutations in high-grade neuroendocrine carcinoma of the colon. J Natl Compr Canc Netw. 2018 Sep;16(9):1035-40.
5. Potocki PM, Wójcik P, Chmura Ł, et al. Clinical characterization of targetable mutations (BRAF V600E and KRAS G12C) in advanced colorectal cancer-a nation-wide study. Int J Mol Sci. 2023;24(10):9073. 2023 May 22.
6. Sinha R, Larkin J, Gore M, Fearfield L. Cutaneous toxicities associated with vemurafenib therapy in 107 patients with BRAF V600E mutation-positive metastatic melanoma, including recognition and management of rare presentations. Br J Dermatol. Oct 2015;173(4):1024-31.
7. Tabernero J, Velez L, Trevino TL, et al. Management of adverse events from the treatment of encorafenib plus cetuximab for patients with BRAF V600E-mutant metastatic colorectal cancer: insights from the BEACON CRC study. ESMO Open. 2021;6(6):100328.
8. Vanneste L, Wolter P, Van den Oord JJ, Stas M, Garmyn M. Cutaneous adverse effects of BRAF inhibitors in metastatic malignant melanoma, a prospective study in 20 patients. J Eur Acad Dermatol Venereol. Jan 2015;29(1):61-8.
9. Dalle S, Poulalhon N, Thomas L. Vemurafenib in melanoma with BRAF V600E mutation. N Engl J Med. 2011;365(15):1448-50.
10. Meneguzzo A, Lazzarotto A, Alaibac M. Eruptive Melanocytic Nevi Secondary to Encorafenib for BRAF Mutant Metastatic Colorectal Cancer. In Vivo. 2020;34(1):441-5.
11. Anforth RM, Carlos GR, Scolyer RA, Chou S, Fernandez-Peñas P. Eruptive naevi in a patient treated with LGX818 for BRAF mutant metastatic melanoma. Melanoma Res. 2015;25(1):91-4.
12. Su F, Viros A, Milagre C, et al. RAS mutations in cutaneous squamous-cell carcinomas in patients treated with BRAF inhibitors. New England Journal of Medicine. 2012;366(3):207-15.
13. Pfizer. BRAFTOVI (encorafenib) [prescribing information]. Pfizer Medical Information. Retrieved from www.pfizermedicalinformation.com/braftovi/full-patient-information.
14. Skin toxicities associated with BRAF and MEK inhibitors. eviQ. 2013. Retrieved from www.eviq.org.au/clinical-resources/side-effect-and-toxicity-management/hair-skin-and-nails/1426-skin-toxicities-associated-with-braf-and-mek.

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Polyarteritis Nodosa with Concurrent CMV Infection: A Case Report and Brief Literature Review

Lauren Schild, MS IV; and Matthew Schaffer, DO

Abstract

A previously healthy 36-year-old male presented to the ED with a six-week history of severe migratory abdominal pain, nightly fevers, fatigue, and weight loss. Labs showed elevated LFTs, CRP, D-dimer, and lymphocytosis along with positive serology for cytomegalovirus (IgM, IgG, DNA). Abdominal CT showed a superior mesenteric venous thrombosis, portal mesenteric venous thrombosis, and multiple splenic infarcts. Diagnostic angiography revealed numerous arterial microaneurysms consistent with polyarteritis nodosa. CMV infection is typically self-limited with complete recovery within days to weeks and in exceedingly rare cases has been reported to cause venous thromboses and splenic infarctions. Polyarteritis nodosa is an ANCA-negative necrotizing vasculitis of medium muscular arteries that typically presents with systemic symptoms and can affect any organ but typically spare the lungs.

Introduction

Polyarteritis nodosa (PAN) is likely an umbrella term for a form of anti-neutrophil cytoplasmic antibodies (ANCA)-negative necrotizing vasculitis that typically affects medium-sized arteries, causing intimal thickening. This thickening is thought to be related to immune-complex deposition causing inflammation of the artery which can lead to lumen narrowing and potentially thrombosis. In addition, thickened areas tend to be more fragile than surrounding tissue, leading to aneurysm formation. The most commonly affected organs in PAN are the kidneys, however manifestations in the skin, GI system, nervous system, musculature, and cardiac muscle are not uncommon. The lungs are classically spared. PAN may be idiopathic or due to secondary causes such as infections like hepatitis B, hepatitis C or conditions such as hairy cell leukemia among others.[1-3] The most common secondary cause of PAN is infection with hepatitis B. Initial presentation can be highly variable dependent on the site of affected vessels, ranging from hypertension to tender, erythematous nodules or purpura to myalgia to intestinal angina, often with the systemic signs like fatigue, weight loss, fevers, and arthralgia.

A member of the herpesvirus family, human cytomegalovirus (CMV) is a relatively ubiquitous virus that is typically benign in immunocompetent adults though remains latent in host myeloid cells with potential for reactivation. When symptomatic, CMV most commonly causes symptoms of mononucleosis such as fever, fatigue, rash, and leukocytosis and does not require a definitive diagnosis. However, immunocompromised patients may be at risk for more severe symptoms due to organ involvement, such as fulminant liver failure, colitis, subacute encephalitis, and pneumonitis.[4] In cases of severe infection, treatment with antivirals such as foscarnet or ganciclovir, among others, is an option though efficacy is limited by poor bioavailability with oral intake, viral mutations, and drug toxicity.[5]

Case

A 36-year-old male presented initially with 10-day history of pain in the central lower abdomen and pelvis with mild dysuria. He was initially treated for suspected prostatitis and labs were negative for bacteriuria or sexually transmitted diseases. The following day, he had worsening pain, now in the left lumbar region and associated headaches, myalgia, and nighttime fevers up to 102F. Labs were significant for elevated liver function tests and c-reactive protein though CT scan showed no abnormalities. In the following weeks, he continued to have nighttime fevers, extreme fatigue, and left upper quadrant pain with 7.5 kg weight loss. He also developed increased abdominal pain following meals. Differentials considered included intestinal angina, abdominal abscess, infection such as Epstein-Barr virus, HIV, or cancer such as leukemia/lymphoma. At this time, the pain was constant and significantly intensified with deep breaths or movement. Repeat abdominal CTs revealed two wedge-shaped splenic infarcts followed by mesenteric vein thrombosis and portal vein thrombosis. Labs to this point had

been negative for viral hepatitis, Epstein Barr virus, or HIV, and showed positive CMV PCR and immunoglobulin M and G titers, significant leukocytosis, elevated c-reactive protein, elevated D-dimer, and elevated liver function tests. His pain was uncontrolled with IV morphine. At this time, he was transferred to a higher-acuity medical facility for evaluation where infectious disease, rheumatology, and hematology-oncology specialists were consulted. The rheumatologist suspected a form of vasculitis and ordered diagnostic angiography which showed numerous microaneurysms in various abdominal arteries, consistent with PAN. Vessel biopsies were not completed at that time. He was treated with valacyclovir for CMV infection as well as pulse-dose steroids for three days followed with continued high-dose prednisone and prophylactic omeprazole and Bactrim while on the steroid. Prior to discharge, he was started on Cytoxan and mesna for treatment of PAN, and liver function tests had improved. Upon follow-up with primary care, the patient reported significant improvement in symptoms though noted poor sleep and fatigue which were thought to be related to steroid use. He sees rheumatology for close follow up and is slowly attempting to return to work.

Lab	Value	Reference range
AST	183 (H)	10-37 U/L
ALT	259 (H)	16-50 U/L
WBC	17 × 10^9/L (H)	3.5 to 11.3 × 10^9/L
CRP	103.7 (H)	<=5.0 mg/L
D-dimer	3930 (H)	0-400
LDH	325 (H)	125-220 U/L
HIV	Non-reactive	Non-reactive
CMV IgM	Positive (H)	Negative
CMV IgG	Positive (H)	Negative
Hep A IgM	Non-reactive	Non-reactive
HBsAg	Non-reactive	Non-reactive
Hep B Core IgM AB	Non-reactive	Non-reactive
Hep C Antibody	Non-reactive	Non-reactive

Figure 1. CT scan showing a wedge-shaped splenic infarct noted by the white arrows.

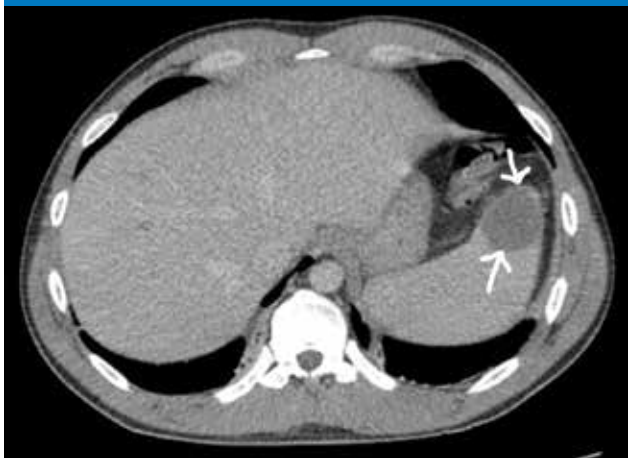


Figure 2. Angiography showing a saccular aneurysm in the mid-splenic artery noted by the white arrow.

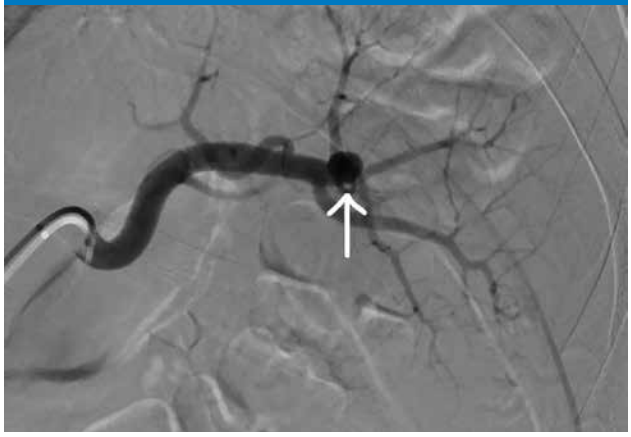
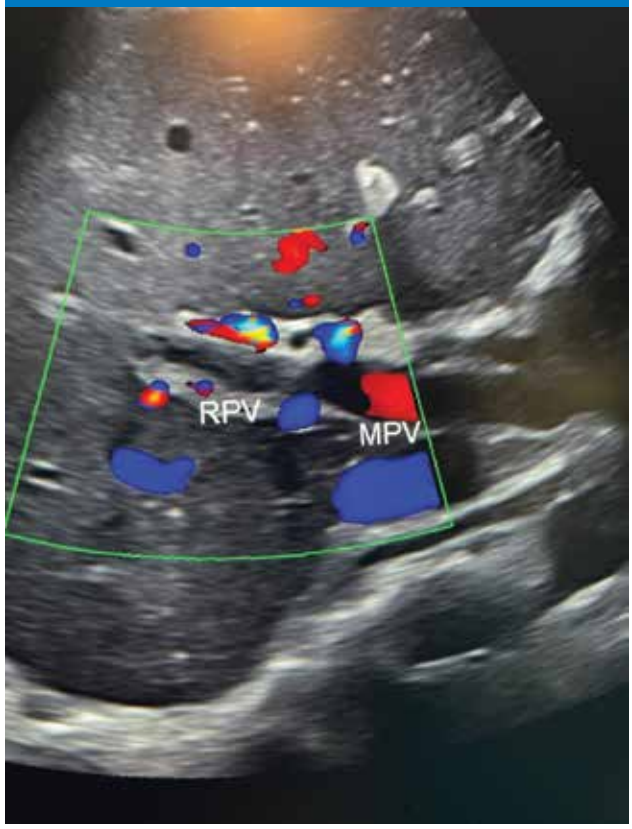


Figure 3. Abdominal ultrasound demonstrating blood flow present in the main portal vein (MPV) and absent flow in the right portal vein (RPV) due to thrombus.



Discussion and Summary

The causes of acute abdominal pain are numerous and highly varied. Polyarteritis nodosa is a rare disease marked by inflammation and proliferation of the tunica intima, causing vessel narrowing and weakening. Patient presentation in PAN depends on which vessels are affected and can include fatigue, fevers, weight loss, tender and erythematous skin nodules, palpable purpura, mononeuritis multiplex, intestinal angina, or hypertension. The most commonly affected organs in PAN are the kidney and skin. Lab testing often includes CBC, CMP, urinalysis, viral hepatitis panel, HIV testing, and various other autoimmune markers. Diagnosis is mostly clinical but is aided by CT-angiogram or MRI studies demonstrating vessel narrowing and aneurysms and biopsy of affected vessels. Several infectious agents are known to be associated with secondary PAN, including hepatitis B and C, and parvovirus B-19, among others. CMV infection typically causes symptoms similar to mononucleosis, including fever, fatigue, and rash in immunocompetent patients. In our case, the patient presented with severe abdominal pain which never fully remitted and was not initially linked to meals as would be expected of intestinal angina or cholelithiasis. In addition, he did not display any cutaneous findings commonly associated with PAN. Laboratory studies looking for a potential cause of the patient's PAN were significant only for current CMV infection. Several case reports have shown a concomitant CMV infection in patients newly diagnosed with PAN where other testing was negative, similar to our case.[6-8] One case report also discusses the occurrence of venous thrombosis and arterial infarction associated with acute CMV infections.[9] PAN relapses often occur within 5 years, and individuals with evidence of CNS or abdominal involvement tend to have poorer prognosis due to risk of stroke or bowel perforation. Cases of PAN caused by hepatitis B or C tend to have lower risk of recurrence if the infection clears.[10] Currently, the patient discussed in this case has recovered and has had no symptoms of disease in several months.

REFERENCES

1. Guillevin L, Mahr A, Callard P, Godmer P, Pagnoux C, Leray E, et al. Hepatitis B virus-associated polyarteritis nodosa. Medicine. 2005 Sept;84(5):313-22.
2. Ramos-Casals M, Muñoz S, Medina F, Jara LJ, Rosas J, Calvo-Alen J, Brito-Zerón P, Forns X, Sánchez-Tapias JM; HISPAMEC Study Group. Systemic autoimmune diseases in patients with hepatitis C virus infection: characterization of 1020 cases (The HISPAMEC Registry). J Rheumatol. 2009 Jul;36(7):1442-8.
3. Hasler P, Kistler H, Gerber H. Vasculitides in hairy cell leukemia. Semin Arthritis Rheum. 1995 Oct;25(2):134-42.
4. Griffiths P, Reeves M. Pathogenesis of human cytomegalovirus in the immunocompromised host. Nat Rev Microbiol. 2021 Dec;19(12):759-73.
5. Chen SJ, Wang SC, Chen YC. Antiviral agents as therapeutic strategies against cytomegalovirus infections. Viruses. 2019 Dec 23;12(1):21.
6. Kouchi M, Sato S, Kamono M, Taoda A, Iijima K, Mizuma A, Kitao R, Mihara M, Ozawa H, Ishihara T, Takagi A, Suzuki Y. A case of polyarteritis nodosa associated with cytomegalovirus infection. Case Rep Rheumatol. 2014; 2014:604874.
7. Abadeer K, Aslam N, Cortese C, Wadei HM. Cytomegalovirus-induced polyarteritis nodosa in a liver transplant recipient. Am J Transplant. 2017 Dec;17(12):3236-40.
8. Doherty M, Bradfield JW. Polyarteritis nodosa associated with acute cytomegalovirus infection. Annals of the Rheumatic Diseases. 1981 Aug 1;40(4):419-21.
9. Blackwood GA, Danta M, Gett R. Acute cytomegalovirus infection associated with splenic infarction: a case report and review of the literature. Cureus. 2022 Mar 22;14(3):e23404.
10. Pagnoux C, Seror R, Henegar C, Mahr A, Cohen P, Le Guern V, Bienvenu B, Mouthon L, Guillevin L; French Vasculitis Study Group. Clinical features and outcomes in 348 patients with polyarteritis nodosa: a systematic retrospective study of patients diagnosed between 1963 and 2005 and entered into the French Vasculitis Study Group Database. Arthritis Rheum. 2010 Feb;62(2):616-26.

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Recurrent Venous Thromboembolism in a Young Adult: A Case Report and Comprehensive Review of Diagnostic Approaches

Nicholas Looby, MD; Cole D. Tessendorf, MD; Jack Hagen, BA; Michelle Looby, PharmD; and Benjamin Liscano, MD

Abstract

Primary lung adenocarcinoma is a rare but critical diagnosis in young adults, often presenting with atypical symptoms. We report the case of a 29-year-old male with no significant medical history who initially presented with deep vein thrombosis (DVT) and recurrent pulmonary emboli (PE) despite appropriate anticoagulation. Further workup ultimately revealed metastatic lung adenocarcinoma, diagnosed post-mortem. This case underscores the importance of considering occult malignancy in young patients with unprovoked or recurrent venous thromboembolism. Early recognition of underlying cancer in such atypical presentations may facilitate earlier diagnosis and intervention, potentially improving patient outcomes.

Introduction

Venous thromboembolism (VTE), including deep vein thrombosis (DVT) and pulmonary embolism (PE), is a significant cause of morbidity and mortality particularly when it occurs in the absence of identifiable risk factors. While malignancy is a well-recognized cause of unprovoked VTE, it is often overlooked in younger patients who lack traditional cancer risk factors.[1] Lung cancer, despite being the leading cause of cancer-related mortality worldwide, is rarely considered in young, nonsmoking adults, where adenocarcinoma is the predominant histological subtype.[2] These cases frequently present at advanced stages due to their often vague and nonspecific symptoms, delaying diagnosis and limiting treatment and intervention options.[3]

Hypercoagulability is a hallmark of cancer, with malignancy-associated thrombosis occurring through multiple mechanisms, including tumor-related inflammation, direct vascular invasion, and activation of the coagulation cascade..[1] In some cases, recurrent or refractory thrombotic events may be the first manifestation of an underlying malignancy, underscoring the importance of a comprehensive evaluation in patients with unexplained VTE.[1,2] While laboratory findings like elevated dilute Russell's viper venom test (DRVV) and JAK2 mutations are associated with both myeloproliferative disorders and malignancy-induced hypercoagulability, the absence of additional supporting or confirmatory laboratory and radiographic evidence can complicate diagnostic efforts.[4,5]

We present the case of a young adult male with recurrent, unprovoked VTE who was ultimately diagnosed with metastatic primary lung adenocarcinoma post-mortem. This case highlights the need for heightened clinical suspicion in similar presentations, as early recognition and investigation of potential malignancy could improve diagnostic accuracy and patient outcomes.

Case Report

A 29-year-old Caucasian male with no significant past medical history initially presented to a rural clinic with a lower extremity DVT. Documentation from this encounter was limited, but he was started on rivaroxaban 20 mg once daily without further workup. Several months later, he presented to a rural emergency department with chest pain and dyspnea that had been intermittent for six weeks. He reported compliance with anticoagulation with no missed doses. D-dimer was elevated, and CT angiography (CTA) revealed bilateral segmental and subsegmental PEs, possible right heart strain, and peripheral airspace opacities were concerning for pulmonary infarctions or hemorrhage.

He was transferred to a Level 1 trauma center, where initial laboratory workup showed a platelet count of 64 × 10^3/μL (normal: 150–450 × 10^3/μL), hemoglobin of 14.4 g/dL

(normal: 13.8–17.2 g/dL), and a white blood cell (WBC) count of 12 × 10^3/µL (normal: 4.5–11 × 10^3/µL). Coagulation studies revealed an international normalized ratio (INR) of 1.3 (normal: 0.9–1.2), prothrombin time (PT) of 16.5 seconds (normal: 11–13.5 seconds), partial thromboplastin time (PTT) of 29.5 seconds (normal: 25–35 seconds), and a rivaroxaban trough level of less than 25 ng/mL. A heparin drip was initiated to achieve INR greater than 2, and hematology/oncology and vascular surgery were consulted. Vascular surgery determined that no intervention was indicated. An electrocardiogram (EKG) showed sinus tachycardia without abnormalities, and an echocardiogram revealed mild right heart strain. A hypercoagulability workup was pursued, which demonstrated normal levels of cardiolipin IgG/IgM, beta-2 glycoprotein IgG/IgM, and lupus anticoagulant. However, DRVV was elevated at 44.9 seconds (normal 29–38 seconds), with a confirmation ratio of 1.53 (normal <1.4). Testing for paroxysmal nocturnal hemoglobinuria (PNH) was negative.

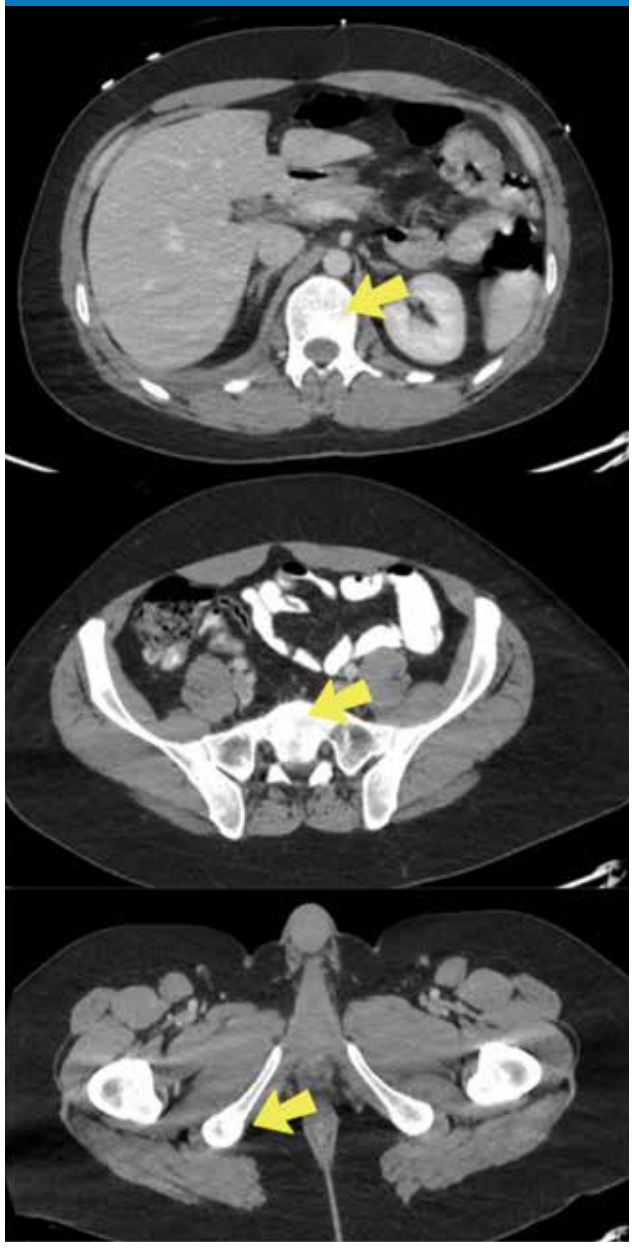
After four days, the patient was discharged on warfarin for prevention of recurrent VTE, as the underlying cause remained unknown. He was instructed to follow up with his primary care physician (PCP) within one week, undergo weekly INR checks, and schedule outpatient hematology and cardiology follow-ups.

At his one-week PCP visit, INR and PT were reported as within normal limits (normal INR: 0.8–1.2 and PT: 11–13.5 seconds). He denied dyspnea or chest pain and reported good compliance with warfarin. However, the following week, he presented again to the rural emergency department with persistent dyspnea and chest pain. Repeat laboratory testing showed an elevated troponin level, an elevated B-type natriuretic peptide (BNP), and a supratherapeutic INR of 5.87. CTA revealed a new right-sided pleural effusion and acute multifocal PEs in addition to the prior emboli. Incidental sclerotic bone lesions were also noted, raising concern for metastatic disease, prompting transfer back to the Level 1 trauma center.

At the trauma center, vascular surgery was again consulted but determined the patient was not a thrombectomy candidate. Thoracentesis with cytology was recommended once the patient was hematologically stabilized, in which heparin was restarted with small doses of vitamin K to normalize INR. Hematology/oncology was consulted for management of recurrent PEs and incidental bony sclerotic lesions. Repeat CT of the abdomen and pelvis showed numerous osseous sclerotic lesions concerning for metastatic disease, with no evidence of a primary lesion (Figure 1). Given the high suspicion for primary lung malignancy, thoracentesis with cytology was planned.

Further laboratory testing revealed abnormalities in serum protein electrophoresis, which showed two protein spikes in the gamma fraction. Alpha-1 globulin was elevated at 0.4 g/dL (normal: 0.1–0.3 g/dL), and alpha-2 globulin was also elevated at 1.3 g/dL (normal: 0.5–1.0 g/dL). Protein free light

Figure 1. CT abdomen and pelvis with sclerotic bone lesions. Axial views of CT imaging showing hyperdense sclerotic lesions throughout the spine, sacrum, and pelvis. The yellow arrows indicate many of the hyperdense sclerotic lesions.



chains were abnormal, with a kappa free light chain level of 5.75 mg/dL (normal: 0.33–1.94 mg/dL), a lambda free light chain level of 3.09 mg/dL (normal: 0.57–2.63 mg/dL), and a kappa/lambda ratio of 1.86 (normal: 0.26–1.65). Prostate-specific antigen (PSA) was normal, while JAK2 mutation testing was positive at 0.06%, though at a very low percentage with unclear clinical significance.

On hospital day three, the patient had continued to improve, and the heparin drip was stopped in preparation for thoracentesis later that afternoon. That morning, the hospitalist team evaluated him at bedside and found him stable and without respiratory distress or complaints. However, just hours later, the primary team was notified that he had suddenly become tachypneic, was experiencing severe dyspnea and right-sided chest pain, was tripoding, and required 6L of supplemental oxygen to maintain oxygen saturation above 90%. He was given 5 mg of metoprolol but showed no meaningful improvement. While preparing for transfer to the critical care unit, the patient experienced suspected cardiac arrest. Despite 45 minutes of attempted cardiopulmonary resuscitation, the patient died.

Post-mortem examination revealed multiple small contusions of varying ages along the bilateral upper and lower extremities, as well as venous and intraosseous access sites. A total of 2300 mL of serosanguinous fluid was collected from the right chest, and pulmonary emboli of varying ages were identified within all lung lobes, both centrally and peripherally. The hilar region of the left lung appeared grossly fibrotic, and a single, irregular hilar lymph node measuring 2.3 cm was noted. Microscopic examination of the lung and lymph node demonstrated extensive lymphatic invasion by adenocarcinoma, with multifocal disease throughout the lung tissue. Immunohistochemical staining for thyroid transcription factor-1 (TTF-1) was diffusely positive in cancer cells, supporting a diagnosis of primary lung adenocarcinoma. The remaining lung tissue exhibited vascular congestion, and the L1 lumbar vertebra contained a 2.7 cm sclerotic lesion, which was confirmed to be metastatic adenocarcinoma.

Discussion

A VTE is when a clot, or thrombus, forms within veins. The most common types are a DVT, which primarily affects the legs, and a PE, which occurs when a clot travels to the lungs.[1] Risk factors for VTE—whether acquired or hereditary—can be identified in most patients and include hereditary thrombophilia, prothrombotic conditions, recent trauma or hospitalization, prolonged immobilization, certain medications or hormone replacement therapy, advanced age, and underlying malignancy, among others.[6,7] These factors contribute to a lower incidence of DVT in younger individuals, with risk increasing significantly after age 40. Additionally, the risk of DVT in older adults is compounded by a greater prevalence of medical comorbidities and other predisposing conditions.[7,8] Although up to 40% of DVT cases are idiopathic,[9] any first-time occurrence in an adult, particularly adults aged 45 and younger, warrants further investigation.

When any patient presents with an unprovoked VTE, a thorough history and physical examination, along with a review of diagnostic imaging and routine laboratory testing, is essential. Prolonged sitting or immobility, like during long car rides, flights, or bed rest, especially when combined with other risk factors like recent surgery, pregnancy, obesity, or taking certain medications, are common inciting factors for clots. Routine labs such as a complete blood count (CBC) and peripheral blood smear may reveal elevated hematocrit or platelet count, raising suspicion for a myeloproliferative disorder such as polycythemia vera or essential thrombocythemia.[10] Additionally, anemia, leukopenia, or thrombocytopenia may be present, suggesting an underlying hematologic abnormality. The presence of red cell fragmentation or schistocytes on a blood smear may indicate disseminated intravascular coagulation (DIC) or thrombotic microangiopathies, such as thrombotic thrombocytopenic purpura (TTP) or hemolytic uremic syndrome (HUS). A urinalysis and serum chemistry panel evaluating liver and renal function may provide further insight, particularly if hematuria or signs of organ dysfunction are present. Markedly elevated erythrocyte sedimentation rate (ESR) may suggest an underlying malignancy or connective tissue disorder.[7,11]

Certain patient characteristics may indicate the need for additional hypercoagulability testing, particularly those in patients younger than 45, with a family history of VTE, or with recurrent VTEs. A standard workup includes testing for Factor V Leiden, prothrombin 20210A mutation, protein C and S deficiency, antithrombin deficiency, and JAK2 mutations, as well as testing for antiphospholipid syndrome (APS) with DRVV, anticardiolipin antibodies, and beta-2 glycoprotein I antibodies.[5,12,13] While DRVV elevation is commonly associated with APS, it can also result from direct oral anticoagulants (DOACs), factor deficiencies, or malignancy-associated coagulopathy.[13,14] In our patient's case, the elevated DRVV and absence of all confirmatory

APS antibodies align more with an underlying malignancy-associated prothrombotic condition rather than true APS.

Similarly, JAK2 mutations, though primarily linked to myeloproliferative disorders, have been detected in patients with unexplained thrombosis even at low allelic burdens.[5,12] The JAK2 allelic burden, which reflects the proportion of blood cells carrying the mutation, is categorized as high (>50%) in classic myeloproliferative disorders and low (<5-10%) in some thrombosis-prone individuals. The significance of very low JAK2 positivity (<1%) remains unclear, though some studies suggest that even very low positivity may contribute to thrombosis, particularly in malignancy-associated clonal hematopoiesis.[15,16]

Malignancy is another well-established cause of unprovoked VTE. Several studies have reported an increased incidence of underlying malignancies in patients presenting with VTE.[17-19] If occult malignancy is suspected, additional evaluation may include chest, abdominal, and pelvic CT imaging, tumor markers such as carcinoembryonic antigen (CEA), alpha-fetoprotein (AFP), CA 19-9, CA 125, and prostate-specific antigen (PSA), serum calcium levels, mammography, Pap smear, and upper and lower gastrointestinal tract evaluation.[4,20,21] In our patient, several of these tests either returned normal results or remained pending at the time of his death. Table 1 summarizes the laboratory and imaging studies performed, with the final diagnosis confirmed post-mortem.

Lung cancer is the leading cause of cancer-related mortality worldwide and is most commonly associated with adults who have a history of smoking. However, lung cancer in young adults, though rare, does occur. Studies suggest that individuals aged 18–35 years account for less than 2% of all lung cancer cases.[2,3] Among these patients, adenocarcinoma is the predominant histological subtype, representing approximately 50% of cases. A majority of patients present with advanced disease, with nearly 70% diagnosed at stage IIIb or IV. Since adenocarcinoma primarily spreads hematogenously, the pleura and bone are among the most common metastatic sites.[2(p35),3]

Regarding risk factors, 26.7% of young lung cancer patients have a family history of lung cancer, and 72.4% are former or current smokers.[2] In patients who are nonsmokers and lack a family history, the etiology remains largely unknown. Recent studies have identified common genetic alterations in

Table 1. Differential diagnoses.

Diagnosis	Supporting factors	Refuting factors	Final outcome
Hypercoagulability disorder	Elevated DRVV, positive JAK2 mutation, recurrent VTEs despite anticoagulation	No other myeloproliferative markers, low JAK2% not clinically significant	Ruled out due to lack of supporting evidence
Infectious etiology	Intermittent dyspnea, chest pain	No fever, no leukocytosis, no infectious infiltrate on imaging	Ruled out based on clinical and laboratory findings
Autoimmune disease	Elevated Alpha 1/2 globulin levels, intermittent symptoms	No ANA positivity, no joint involvement	Not pursued further due to lack of systemic autoimmune markers
Cardiovascular disease	Right heart strain on echo, elevated BNP	No overt cardiac disease, no history of heart failure	Mild right heart strain but not primary cause of symptoms
Paraneoplastic syndrome	Multiple systemic symptoms including hypercoagulability	No definitive malignancy markers at initial presentation	Likely a component but no definitive confirmation
Drug-induced coagulopathy	Elevated INR despite normal dosing	No hepatotoxic drugs or overdose history	Not a primary factor in this case
Hematologic malignancy	Abnormal protein electrophoresis, bone involvement	No lymphadenopathy, no blasts on peripheral smear	Not consistent with leukemia/lymphoma presentation
Pulmonary hypertension	Progressive dyspnea, right heart strain	No longstanding history of dyspnea or hypoxia	Right heart strain secondary to PEs rather than intrinsic PH
Chronic thromboembolic disease	Multiple recurrent PEs despite anticoagulation	No chronic pulmonary embolism patterns on imaging	Confirmed recurrent thromboembolic events due to malignancy
Primary malignancy	Sclerotic bone lesions, persistent pleural effusion, weight loss	No clear primary mass initially identified	Confirmed as primary lung adenocarcinoma post-mortem

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young patients, including mutations in EGFR, HER2, and KRAS, though no reliable risk factors have been established to predict lung cancer development before its onset.[22]

Our patient's clinical scenario of unprovoked pulmonary emboli and progression of recurrent VTEs despite anticoagulation therapy was ultimately explained by his undiagnosed advanced lung cancer. The pleural effusion, cough, and worsening dyspnea were likely manifestations of cancer infiltration in the lung tissue and the increasing thrombotic burden within the pulmonary vasculature, leading to higher oxygen demands and impaired respiratory function. In a young adult with an unprovoked DVT, a thorough investigation is warranted. Unfortunately in our described case, it remains uncertain whether an earlier diagnosis would have altered his prognosis. This case underscores the importance of a comprehensive workup for younger patients with idiopathic VTE, particularly those with a personal or family history of VTE or recurrent thrombotic events. Early recognition and investigation of potential coagulation disorders or occult malignancies may facilitate earlier diagnosis and improve patient outcomes.

REFERENCES

1. Khorana AA, McCrae KR, Milentijevic D, et al. Current practice patterns and patient persistence with anticoagulant treatments for cancer-associated thrombosis. Res Pract Thromb Haemost. 2017;1(1):14-22.
2. Liu B, Quan X, Xu C, et al. Lung cancer in young adults aged 35 years or younger: A full-scale analysis and review. J Cancer. 2019;10(15):3553-9.
3. Li J, Yang F, Li X, et al. Characteristics, survival, and risk factors of Chinese young lung cancer patients: the experience from two institutions. Oncotarget. 2017;8(51):89236-44.
4. Piccioli A, Lensing AWA, Prins MH, et al. Extensive screening for occult malignant disease in idiopathic venous thromboembolism: a prospective randomized clinical trial. J Thromb Haemost. 2004;2(6):884-9.
5. Pardanani A, Lasho TL, Hussein K, et al. JAK2V617F Mutation Screening as Part of the Hypercoagulable Work-up in the Absence of Splanchnic Venous Thrombosis or Overt Myeloproliferative Neoplasm: Assessment of Value in a Series of 664 Consecutive Patients. Mayo Clin Proc. 2008;83(4):457-9.
6. Blann AD, Lip GYH. Venous thromboembolism. BMJ. 2006;332(7535):215-9.
7. Spencer FA, Emery C, Lessard D, et al. The Worcester Venous Thromboembolism study: a population-based study of the clinical epidemiology of venous thromboembolism. J Gen Intern Med. 2006;21(7):722-7.
8. Goldhaber SZ, Savage DD, Garrison RJ, et al. Risk factors for pulmonary embolism. Am J Med. 1983;74(6):1023-8.
9. Fowkes FJI, Price JF, Fowkes FGR. Incidence of diagnosed deep vein thrombosis in the general population: Systematic review. Eur J Vasc Endovasc Surg. 2003;25(1):1-5.
10. Chait Y, Condat B, Cazals-Hatem D, et al. Relevance of the criteria commonly used to diagnose myeloproliferative disorder in patients with splanchnic vein thrombosis. Br J Haematol. 2005;129(4):553-60.
11. Nicolaides AN, Fareed J, Kakkar AK, et al. Prevention and treatment of venous thromboembolism--International Consensus Statement. Int Angiol J Int Union Angiol. 2013;32(2):111-260.
12. Vannucchi AM, Guglielmelli P, Tefferi A. Advances in understanding and management of myeloproliferative neoplasms. CA Cancer J Clin. 2009;59(3):171-91.
13. Devreese K, Hoylaerts MF. Laboratory diagnosis of the antiphospholipid syndrome: a plethora of obstacles to overcome. Eur J Haematol. 2009;83(1):1-16.
14. Dentali F, Squizzato A, Brivio L, et al. JAK2V617F mutation for the early diagnosis of Ph- myeloproliferative neoplasms in patients with venous thromboembolism: a meta-analysis. Blood. 2009;113(22):5617-23.
15. Lin Y, Liu E, Sun Q, et al. The Prevalence of JAK2, MPL, and CALR Mutations in Chinese Patients With BCR-ABL1-Negative Myeloproliferative Neoplasms. Am J Clin Pathol. 2015;144(1):165-71.
16. Zon RL, Sekar A, Clapham K, et al. JAK2-mutant clonal hematopoiesis is associated with venous thromboembolism. Blood. 2024;144(20):2149-54.
17. Robertson L, Yeoh SE, Broderick C, Stansby G, Agarwal R. Effect of testing for cancer on cancer- or venous thromboembolism (VTE)-related mortality and morbidity in people with unprovoked VTE. Cochrane Database Syst Rev. 2018;11(11):CD010837.
18. Iodice S, Gandini S, Löhr M, Lowenfels AB, Maisonneuve P. Venous thromboembolic events and organ-specific occult cancers: a review and meta-analysis. J Thromb Haemost JTH. 2008;6(5):781-8.
19. Nordström M, Lindblad B, Anderson H, Bergqvist D, Kjellström T. Deep venous thrombosis and occult malignancy: an epidemiological study. BMJ. 1994;308(6933):891-4.
20. Hettiarachchi RJK, Lok J, Prins MH, Buller HR, Prandoni P. Undiagnosed malignancy in patients with deep vein thrombosis: Incidence, risk indicators, and diagnosis. Cancer. 1998;83(1):180-5.
21. Delluc A, Antic D, Lecumberri R, Ay C, Meyer G, Carrier M. Occult cancer screening in patients with venous thromboembolism: guidance from the SSC of the ISTH. J Thromb Haemost. 2017;15(10):2076-9.
22. Pan X, Lv T, Zhang F, Fan H, Liu H, Song Y. Frequent genomic alterations and better prognosis among young patients with non-small-cell lung cancer aged 40 years or younger. Clin Transl Oncol. 2018;20(9):1168-74.

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Hidden In Plain Sight: A Public Health Cross-Sectional Project to Address Syphilis and HIV in South Central South Dakota's Incarcerated Populations

Bailey Smith, MS IV; Holly Gerberding, MS IV; and Anora Henderson, MD

Abstract

Introduction: Syphilis, caused by *Treponema pallidum*, is a major public health concern, particularly in high-risk populations like incarcerated individuals. Timely diagnosis remains challenging, especially in rural and frontier communities. This study aims to assess the effectiveness of point-of-care (POC) syphilis and HIV testing at the Winner City Jail in South Dakota, a rural correctional facility with a high prevalence of syphilis and HIV risk factors.

Methods: This 12-week cross-sectional study (October 2 to December 19, 2024) tested new intakes from nine counties without prior syphilis or HIV history. POC testing was performed using the Chembio DPP HIV-Syphilis immunoassay, followed by confirmatory testing (RPR for syphilis, NAAT for HIV). Demographic and risk factor data were collected via interviews, and treatment was administered based on diagnosis.

Results: Of the 112 individuals tested, seven (6.3%) had reactive syphilis results, all confirmed by RPR testing. One individual tested positive for HIV on POC, but negative on confirmatory testing. Most syphilis cases were late latent stages (86%), and all were asymptomatic. Risk factors included unprotected sex, substance use, and prior incarceration.

Conclusion: POC testing effectively identified syphilis and HIV in a rural correctional setting, enabling early diagnosis and treatment. While the Chembio test was highly accurate for syphilis, the false positive for HIV emphasizes the importance of confirmatory testing. Expanding this approach to other correctional facilities could reduce STI transmission in high-risk populations. Further studies are needed to assess long-term outcomes and expand testing to other STIs.

Background

Since 2021, South Dakota has experienced a dramatic increase in both adult and congenital syphilis cases. Between 2021 and 2023, adult syphilis cases rose by 90%, representing a 2,493% increase compared to the five-year median. Congenital syphilis, including syphilitic stillbirths, has followed a similar trajectory, with a 150% rise since 2021 and a 1,233% increase over the five-year median.[1] Rural and frontier communities bear the highest burden, largely due to barriers in access, cost, and continuity of care.[1] The South Dakota Department of Health has identified several key risk factors for syphilis infection, including heterosexual contact, history of other sexually transmitted infections (STIs), incarceration, American Indian identity, age 25–39, sex while intoxicated, intravenous drug use, and institutionalization.[1] These same factors also elevate the risk of HIV, which is frequently co-infected with syphilis in the state.[2] The Centers for Disease Control and Prevention (CDC) recommends syphilis screening for asymptomatic individuals with risk factors such as incarceration, transactional sex, high-risk geography or race/ethnicity, pregnancy, and for men who have sex with men (MSM), with annual screening advised for MSM.[3] Traditional diagnosis relies on serologic testing, typically involving both treponemal and nontreponemal assays.[4] While these methods are accurate and remain the standard of care, they are limited by challenges in access, affordability, and follow-up—particularly in underserved populations. Point-of-care (POC) testing has gained traction as a practical alternative in high-risk and resource-limited settings.[5] Though POC tests cannot differentiate between past and active infections due to their reliance on antibody detection, they have proven effective in environments such

as county jails and emergency departments for screening high-risk or asymptomatic individuals.[6,7] Effective treatment options are available; however, early and accurate diagnosis is essential to prevent complications and reduce community transmission.[3,8] An equally critical component of disease control is contact tracing, which facilitates early identification and treatment of exposed individuals. This strategy not only interrupts transmission chains but also enhances public health surveillance and response efforts, especially in high-incidence areas like rural South Dakota.[8] This manuscript proposes implementing point-of-care syphilis screening in a rural South Dakota jail, targeting high-risk individuals to improve early detection, support timely treatment, and facilitate contact tracing as part of a comprehensive approach to controlling the spread of syphilis.

Methods

The primary objective of this cross-sectional study was to determine the number of undiagnosed syphilis and HIV infections among new intakes at the Winner City Jail. Secondary objectives included identifying risk factors for infection, conducting contact tracing, and providing pharmacologic treatment to individuals who tested positive. All new inmates weekly were approached for possible inclusion. Individuals with a prior history of syphilis and/or HIV infections, or who declined participation, were excluded. The SDDOH reviewed state records to verify eligibility before participation, and informed consent was obtained. The University of South Dakota Institution Review Boards (IRB) exempted the project as a public health surveillance.

Testing was conducted once weekly for 12 weeks, from October 2, 2024, to December 19, 2024, using the FDA-approved Chembio DPP HIV-Syphilis immunoassay, a rapid test that detects HIV-1/2 and *Treponema pallidum* antibodies using fingerstick whole blood. Results were interpreted using the DPP Micro Digital Reader after 15 minutes. Research personnel received virtual Chembio training, including sample collection, test administration, and result analysis. Quality assurance measures included running reactive/non-reactive controls when receiving new test kit shipments, opening new test kit lots, or when training new operators.[12]

Research personnel conducted follow-up interviews with individuals who had reactive Chembio results, using the SDDOH's HS417 STI form. Demographic data collected included name, date of birth, address, race/ethnicity, gender, and sexual orientation. Risk factors assessed included exposure to STIs, number of male and female partners in the past 12 months, drug use and route of administration, unprotected sexual intercourse, intercourse with IV drug users, and sex while high or intoxicated. Additional information on symptoms (location, onset date, and type) and details on sexual and needle-sharing partners in the past two months were also recorded. Symptom onset data was used to stage syphilis.

Due to a shortage of penicillin G benzathine (Bicillin L-A), non-pregnant participants were treated with doxycycline, as per current guidelines.[8,9] Screening for drug allergies and pregnancy occurred prior to treatment. Those with early syphilis (primary, secondary, or early latent), were treated with 100 mg of doxycycline orally twice daily for 14 days, while those with late syphilis (late latent, tertiary, or unknown duration), were treated with 100 mg of doxycycline orally twice daily for 28 days. HIV-positive individuals were assigned case managers for follow-up care.

Reactive screening results were confirmed with a nontreponemal Reactive Plasma Reagin (RPR) test for syphilis, and a Nucleic Acid Amplification Test (NAAT) with HIV 1/2 Differentiation (HIV 1+2 Ab and HIV-1 p24 Ag) for HIV. Discordant syphilis results were further evaluated with a second confirmatory test, the *Treponema pallidum* particle agglutination (TP-PA). Other STI testing was not performed as part of this project.

Data was recorded using a combination of paper forms, electronic spreadsheets, and secure file transfer. Screening/confirmatory test results, pharmacologic treatment, and HS417 form data were initially recorded on paper by research personnel. Research personnel then transferred data into a de-identified Excel spreadsheet stored on a secure Google Drive, with inmate names replaced by jail identification numbers. All data, including test results and completed HS417 forms, were submitted to the SDDOH via an encrypted, secure email link for contact tracing and baseline reporting. Paper records were stored in the jail's medical office, and accessed only by authorized medical staff. Data accuracy was verified by cross-referencing jail medical records, with missing information obtained from jail medical personnel or SDDOH.

Results

A total of 220 individuals were admitted to the jail during the study period. Of these, 35 were excluded due to a prior history of syphilis and 73 declined participation, resulting in 112 individuals tested. As shown in Table 1, the mean age of the patient population was 36.2 years, with 21 females and 91 males. Racial/ethnic distribution included 87 Native American, 17 Caucasian, 6 African American, 1 Hispanic,

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and 1 Asian. Participants were primarily from Hughes (46), Pennington (38), and Bennett (12) Counties, with others from Gregory, Jackson, Jones, Mellette, Minnehaha, and Tripp Counties (Table 1).

Chembio DPP screening and respective confirmatory test results are shown in Table 2. Seven individuals (6.3%) had reactive Chembio syphilis results, all of whom had reactive nontreponemal RPR tests. Titers ranged from 1:2 to 1:128. One individual had a reactive HIV Chembio test, but confirmatory HIV NAAT with HIV 1/2 Differentiation was negative.

Syphilis staging revealed one case of early latent and six cases of late latent syphilis (Table 3). Early latent syphilis was defined by symptom onset or a partner diagnosis within the past year; individuals not meeting these criteria were presumed late latent syphilis.[8]

Among the seven individuals with reactive syphilis tests, the mean age was 35 years, and the group consisted of one female and six males. Geographically, the individuals were from Hughes (3), Pennington (2), Bennett (1), and Tripp (1) Counties. All identified as Native American and heterosexual. Three reported one sexual partner in the past year, one reported two, and one reported ten. Two individuals had no sexual partners in the past 12 months, with last encounters over two years ago. Reported risk factors included incarceration history, unprotected sexual intercourse, sexual activity while under the influence of drugs or alcohol, intercourse with intravenous drug users, and personal drug use. All were asymptomatic at the time of testing and reported no previous symptoms.

Discussion

The rise in syphilis rates in South Dakota highlights the need for improved screening and treatment interventions, particularly in rural areas with limited healthcare access. The risk factors identified in this study—heterosexual exposure, incarceration, substance use, and high-risk sexual behaviors—align with known determinants of syphilis and HIV transmission and reinforces the vulnerability of incarcerated individuals.[1] The transient nature of jail populations and limited healthcare access make correctional facilities ideal locations for POC testing.[7,10,11] POC testing enables early identification and treatment prior to release or transfer, reducing onward transmission.

This study supports the use of the Chembio DPP HIV-Syphilis Immunoassay as an effective screening tool in correctional settings. Of the 112 individuals tested, seven had reactive syphilis results, all confirmed with nontreponemal RPR testing. This rapid, easy-to-administer POC test provided

Table 1. Characteristics of patients.

	Patients (n = 112)
Mean Age, yrs. (Range)	36.2 (17-67)
Sex, no. (%)	
Female	21 (18.8)
Male	91 (81.3)
Ethnicity, no. (%)	
Asian	1 (0.9)
African American	6 (5.4)
Caucasian	17 (15.2)
Native American	87 (77.7)
Hispanic	1 (0.9)
County, no. (%)	
Bennett	12 (10.7)
Gregory	2 (1.8)
Hughes	46 (41.1)
Jackson	4 (3.6)
Jones	1 (0.9)
Mellette	1 (0.9)
Minnehaha	1 (0.9)
Pennington	38 (33.9)
Tripp	7 (6.3)

Table 2. Chembio DPP HIV-syphilis immunoassay results with respective confirmatory test results.

	Reactive	non-reactive
Syphilis		
Chembio DPP Immunoassay, no. (%)	7 (6.3)	105 (93.8)
Reactive Plasma Reagin (RPR), no. (%)	7 (100)	0 (0)
HIV		
Chembio DPP Immunoassay, no. (%)	1 (0.9)	111 (99.1)
HIV NAAT with HIV 1/2 Differentiation, no. (%)	0 (0)	1 (100)

Table 3. Syphilis stage determination.

	Patients w/ syphilis (n = 7)
Primary, no. (%)	0 (0)
Secondary, no. (%)	0 (0)
Latent, no. (%)	
Early Latent	1 (14)
Late Latent	6 (86)
Tertiary, no. (%)	0 (0)

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results in 15 minutes, allowing for timely treatment, an important component in rural jails where follow-up care may be limited. However, the Chembio test cannot distinguish between acute and past infections, as it detects antibodies rather than active infection. This may lead to persistent reactivity in individuals previously treated for syphilis, although confirmatory testing with nontreponemal assays can help address this limitation.

Despite logistical advantages, the Chembio Immunoassay has potential for false positive and false negative results.[12] For HIV-1/2, the test demonstrates a sensitivity of 99.4% and specificity of 99.6%. For syphilis, sensitivity is 94.7% and specificity is 95.5%.[12] In this study, one individual had a reactive Chembio HIV result that was later ruled out by negative confirmatory NAAT testing, highlighting the small risk for false positives. Such results can cause emotional distress, unnecessary testing, additional costs, and unwarranted treatment. False negatives also remain a concern, particularly for individuals with low antibody levels or early infection stages, which may delay diagnosis and care.[12] These inaccuracies may stem from user error, improper timing during result reading, cross-reactivity with antibodies to other substances, and test limitations.[12] As such, confirmatory testing with RPR, TP-PA, and NAAT remains essential for accurate diagnosis in POC settings.

Contact tracing is another important component for disease control but presents significant challenges in rural jail settings. Limited time with incarcerated individuals, privacy concerns, and mistrust of authorities can impede effective interviews.[13] Additionally, incarcerated individuals may lack accurate contact information for partners or hesitate to disclose details.[13,14] Frequent transfers and release further hinder tracing efforts. Despite these barriers, this project collaborated with the SDDOH to pursue contact tracing as part of its public health surveillance effort. Strengthening partnerships between correctional facilities and public health departments is essential to interrupt transmission in high-risk communities.[14] Additional study limitations include a small sample size of 112 participants, with 33.2% of eligible individuals declining participation. This non-participation may be due to psychological, social, or environmental factors unique to incarcerated populations.[15]

Addressing these barriers requires education, trust-building, privacy protections, and ongoing support to encourage participation in HIV and syphilis testing within correctional settings. Moreover, a larger study would provide more data on the effectiveness of POC testing and its impact on syphilis and HIV transmission within correctional settings. Additionally, the study only included individuals without a known history of syphilis or HIV, excluding cases of reinfection and limiting the generalizability of the findings to more complex health histories.

Future studies should focus on expanding the use of POC testing to other correctional settings, evaluating its effects on transmission rates and health outcomes post-release, as well as integrating with other STI screening programs.

Conclusion

This study highlights the effectiveness of POC HIV and syphilis screening in a rural South Dakota jail, identifying seven previously undiagnosed syphilis infections in a high-risk population. While POC testing offers quick results and early treatment in a transient population, limitations such as false test results and difficulty performing contact tracing should be addressed using confirmatory testing, patient education, and public health coordination. Expanding POC STI testing in correctional facilities could help improve infectious disease transmission and improve comprehensive care in rural and underserved communities.

REFERENCES

1. South Dakota Department of Health. Reducing an unprecedented rise in syphilis rates by enhanced screening & testing. 2023.
2. South Dakota Department of Health. 2023 HIV/AIDS surveillance report U = U. 2023.
3. Hazra A, Collison MW, Davis AM. CDC Sexually transmitted infections treatment guidelines. 2022;327(9):870-1.
4. Satyaputra F, Hendry S, Braddick M, Sivabalan P, Norton R. The laboratory diagnosis of syphilis. J Clin Microbiol. 2021;59(10) :e0010021.
5. Marks M, Mabey DCW. The introduction of syphilis point of care tests in resource limited settings. Expert Rev Mol Diagn. 2017;17(4):321-5.
6. Fakile YF, Markowitz N, Zhu W, et al. Evaluation of a rapid syphilis test in an emergency department setting in Detroit, Michigan. Sex Transm Dis. 2019;46(7):429-33.
7. Spaulding AC, Rabeeah Z, Del Mar González-Montalvo M, et al. Prevalence and management of sexually transmitted infections in correctional settings: a systematic review. Clin Infect Dis. 2022;74(Suppl 2):S193-217.
8. Hicks CB, Clement M. Syphilis: Treatment and monitoring. UpToDate. 2023;(Cdc):1-19. Retrieved from www-uptodate-com.consultaremota.upb.edu.co/contents/syphilis-treatment-and-monitoring?search=sifilis&source=search_result&selectedTitle=2~150&usage_type=default&display_rank=2#H1744448962%0Ahttps://www.uptodate.com/contents/syphilis-treatment-and-.
9. FDA. FDA drug shortages. Vol 2. 2020. Retrieved from www.accessdata.fda.gov/scripts/drugshortages/default.cfm.
10. Javanbakht M, Boudov M, Anderson LJ, et al. Sexually transmitted infections among incarcerated women: findings from a decade of screening in a Los Angeles County Jail, 2002-2012. Am J Public Health. 2014;104(11):e103-9.
11. Obafemi OA, Wendel KA, Anderson TS, et al. rapid syphilis testing for men who have sex with men in outreach settings: evaluation of test performance and impact on time to treatment. Sex Transm Dis. 2019;46(3):191-5.
12. DPP HIV-Syphilis System. Medford, NY: Chembio Diagnostic Systems, Inc. 2020.
13. El-Sadr WM, Platt J, Bernitz M, Reyes M. Contact tracing: barriers and facilitators. Am J Public Health. 2022;112(7):1025-33.
14. Recommendations for partner services programs for HIV infection, syphilis, gonorrhea, and chlamydial infection. Morb Mortal Wkly Report. 2008;57(RR-9):1-4.
15. Meyer CR, Ph D, Moore K. Why do some jail inmates not engage in treatment and why. 2016;58(8):914-30.

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The SDSMA and AMA have expressed concerns about the Senate budget reconciliation bill (officially called the One Big Beautiful Bill Act), citing cuts to Medicaid and Children's Health Insurance Program (CHIP) funding and changes to eligibility criteria that will reduce patients' access to care and affect physician practices' viability, particularly in rural and underserved areas. The SDSMA has been working with the AMA to urge Congress to ensure that Medicaid, Medicare and the Affordable Care Act (ACA) remain reliable sources of coverage for patients. More details are included in a letter sent by the AMA to Senate leaders which notes concerns with the bill's impact on:

- Medicaid and CHIP
- Access to health insurance coverage through the Affordable Care Act (ACA) marketplaces
- Federal support of medical student loans
- Augmented intelligence (AI)—often called artificial intelligence
- Medicare physician payment reform

SDSMA Welcomes MD Class of 2029

SDSMA members and staff helped welcome new students in the MD class of 2029 during USD Sanford School of Medicine orientation last month in Vermillion. On July 21, the first day of orientation, SDSMA President Keith Hansen, MD, spoke to the new class, providing an overview of the SDSMA and its benefits to medical students. Following that, Dr. Hansen and SDSMA communications director Elizabeth Reiss handed out information while tabling at the school's Organizational Fair. On July 25, Immediate Past President Jen Tinguely, MD, MPH, led the Affirmation of the Physician during the White Coat Ceremony. Congratulations to the new class!

Member News

Medical Students: Call for Humanities Submissions

South Dakota Medicine is now accepting and reviewing SSOM submissions for the Humanities Supplement of *South Dakota Medicine* that will be published this fall. Following the success of the inaugural issue in November 2024, the publication will once again primarily feature students' creative work. This is a fantastic opportunity for medical students to have a publication in a professional journal.

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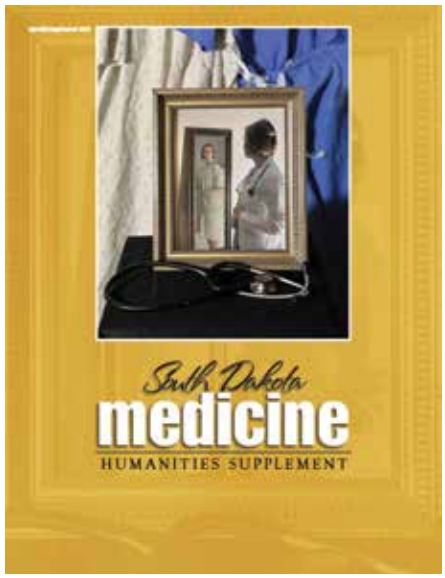

For written submissions, please ensure your submission does not exceed 1,500 words. **Student submissions may be made at any point through September 30, 2025.** Please submit your work to Elizabeth Reiss, *South Dakota Medicine* staff editor, at ereiss@sdsma.org.

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Thank you for your membership in the SDSMA. Association renewal is annual and runs on the calendar year from January-December. In the coming weeks, members will begin receiving renewal notices via email.

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 monthly subscription to *South Dakota Medicine*, 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, collaborative efforts, and events.
- **Education.** Access education programs on current topics and publication opportunities in the peer-reviewed medical journal, *South Dakota Medicine*.
- **Well-Being.** Navigate the stressors of today's ever-changing healthcare landscape and prioritize wellness with the South Dakota Physician Well-Being Program.

American Medical Association Delegate Report – 2025 Annual Meeting

Members of the SDSMA joined more than 700 delegates and alternates from around the U.S. for the 2025 American Medical Association Annual Meeting in Chicago June 6-11. This was the 250th meeting of the House. The gathering was filled with policy debate that will help shape the future of health care in the nation. The AMA's advocacy efforts are directed by the House of Delegates, which works in a democratic process to create a national physician consensus on emerging issues in public health, science, ethics, business and government.

From the SDSMA, attendees were Rob Allison, MD – delegate; Robert Summerer, DO – alternate delegate; Mary Carpenter, MD – alternate delegate; Keith Hansen, MD – SDSMA president; Tammy Hatting – SDSMA CEO; and Barb Smith, outgoing SDSMA CEO. USD SSOM students who attended were Will Brown, Brant Hannahs, Alivia Ankrum and Kiley Medler.

Attendees noted a palpable shift in the tone of the meeting as a response to the persistent inertia in seeing substantive changes in Medicare reimbursements and regulations affecting prior authorization. Outgoing AMA President Bruce Scott, MD, cemented that tone in his opening remarks in which he introduced to the HOD "Angry Bruce." He presented a video from the movie Network, in which citizens were chanting, "I'm mad as hell! I'm not going to take it anymore!" Indeed, some of the resolutions discussed considered physician unions to mitigate administrative burdens and class action lawsuits against health insurance companies to raise awareness of the onus of prior authorization.

House resolutions reflected frustrations with the current administration changes that have occurred since President Trump has taken office again. Several resolutions were specifically directed at protecting residency programs, and the scientific reliability of the NIH. There was concern voiced regarding the preservation of social programs for marginalized patients, and for ongoing funding for medical research programs. Advocacy for maintaining Medicaid programs and access were echoed in some of the resolutions. During the meeting, the House was also incensed with the action taken by HHS Secretary RFK Jr to replace the members of the CDC's Advisory Committee on Immunization Practices. In response, an emergency resolution was passed to address this concern which was also ratified by the SDSMA Board of Directors.

Many from the SDSMA were able to attend the Scope of Practice conference in which various states presented challenges regarding scope creep. Efforts continue at the state levels to maintain physician-led care. Concerns were raised regarding the plethora of "boutique clinics" arising providing little substantive medical care by non-physician practitioners. Additional actions included the following:

AI

In the fast-moving and promising arena of AI, delegates took several actions to strengthen existing policy and ensure that the technology is "explainable," validated, well defined and is not used to conduct medical research fraud." Delegates adopted policy that outlines the steps that must be taken to ensure that health AI remains an asset as it keeps evolving. The share of physicians using AI tools in practice rose from 38% in 2023 to 66% in 2024.

Ultraprocessed foods

The AMA adopted new policy aimed at promoting public awareness and education about the differences between unhealthful, ultraprocessed foods and healthful foods, as well as the benefits of minimally processed and unprocessed foods. As part of this effort, the policy encourages the integration of nutrition education into all levels of medical education to empower physicians to best counsel patients on reducing unhealthful consumption of ultraprocessed foods.

Resident advocacy

To help strengthen the fight against scope of practice expansions, the HOD adopted policy encouraging graduate medical education (GME) programs to promote opportunities for residents and trainees to engage in advocacy for physician-led care. Delegates also directed the AMA to expand educational resources, toolkits and workshops that residency programs can use to teach medical trainees about physician-led care and prepare them to engage effectively with policymakers. The new policy builds on the AMA's existing work to provide resources to residency programs through the AMA GME Competency Education Program, which delivers education to help institutions effectively meet program requirements of the Accreditation Council for Graduate Medical Education.

Standing up for medical students

As part of its wide-ranging commitment to help medical students succeed, the AMA is taking action to address the pressures linked to standardized licensure exams and help unmatched residency applicants. Preparation for the U.S. Medical Licensing Examination (USMLE Step 1) and the Comprehensive Osteopathic Medical Licensing Examination (COMLEX-USA Level 1) is demanding and expensive and may be disrupted by personal crises or family tragedies, so flexibility in scheduling the exam is necessary to accurately reflect the student's true performance. It's essential that all stakeholders in GME work to remove barriers and offer support to trainees during this demanding process to continue building a strong physician workforce.

Next stop: The 2025 Interim Meeting of the AMA House of Delegates is November 14-18 in National Harbor, Maryland.

Robert L. Allison, MD, Delegate
Mary S. Carpenter, MD, Alternate Delegate
Robert J. Summerer, DO, Alternate Delegate

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Board News is a monthly feature sponsored by the South Dakota Board of Medical and Osteopathic Examiners. For more information, contact the Board at SDBMOE@state.sd.us or write to SDBMOE, 101 N. Main Avenue, Suite 301, Sioux Falls, SD 57104.

Help Shape the Future of Medicine in South Dakota

The South Dakota State Medical Association Foundation, the philanthropic arm of the South Dakota State Medical Association, is a tax-exempt 501(C)(3) non-profit corporation, was established to assist and support medical research, medical teaching and medical education at the Sanford School of Medicine.

On average, medical students graduate with $130,000 in debt. Contributions to the South Dakota State Medical Association Foundation provide financial assistance to students at the Sanford School of Medicine and are all designated for scholarships, grants and low-interest loans for students.

Any amount can be donated at any time throughout the year. If you have questions or want more information, please call 605.336.1965.

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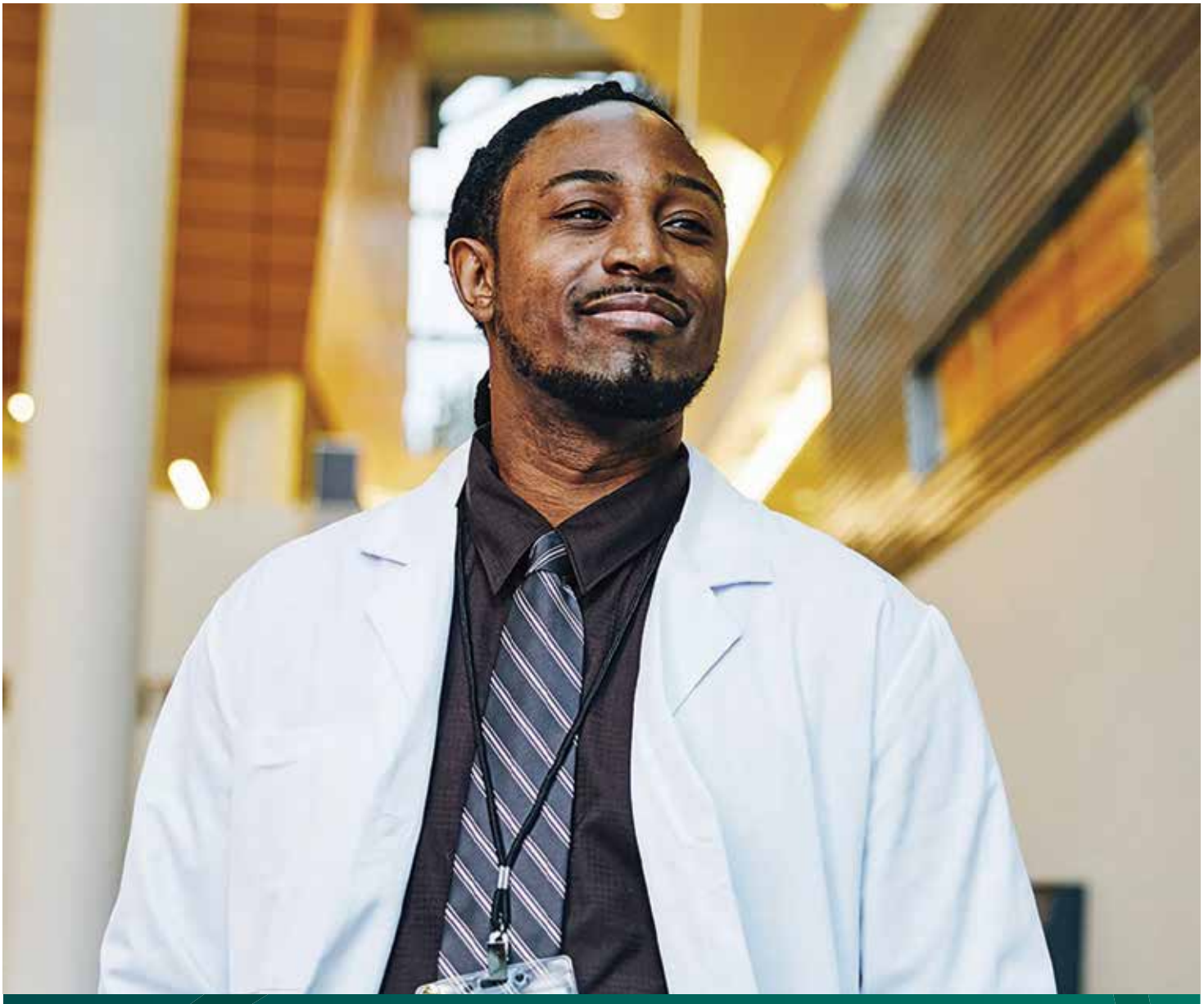

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