Indiana University Student Research Symposium

The following works were accepted for presentation at the Indiana University Student Research Symposium, which serves to highlight student research from all levels of experience in order to ignite interest and support for scientific inquiry in the IUSM medical community.

A Rare Multiple Endocrine Neoplasia Misdiagnosed as Puetz Jegger's Syndrome

◆ **Hasnain F**
Contributing authors: Vaid S, Morgan R

Carney Complex (CNC) is an extremely rare multiple endocrine neoplasia caused by a germline inactivating mutation in protein kinase A type I-alpha regulatory subunit (PRKAR1A gene). The mode of inheritance is predominantly autosomal dominant; 25% of cases are due to de novo mutations. Only 750 world-wide cases have been reported. Most patients are diagnosed in the second or third decade of life. Clinical features include cutaneous myxomas, rare angiomyxoid nodules, lentiginous skin pigmentation, cardiac myxomas, and rare malignant endocrine tumors. These include but are not limited to prolactinomas, thyroid tumors, primary pigmented nodular adrenalcortical disease (PPNAD), psammomatous melanotic schwannomas, and large cell-calcifying Sertoli cell tumors (LCCSCT). Diagnosis is often challenging as disease manifestations occur sporadically over a large span of time.

A 28-year-old Caucasian male with PMH of HFrEF, HTN, Sertoli cell tumor status post orchiectomy, multiple vertebral fractures, and surgical removal of lip angiomyxoma presented to clinic for low testosterone levels. Upon physical examination, he was noted to have markedly distinct Cushingoid features with multiple facial lentigines above his eyes and on his lips. Based upon his incredibly eclectic medical history and unique exam findings, we conducted diagnostic workup to link all the findings. Computed tomography (CT) of his abdomen and pelvis was performed due to ACTH independent hypercortisolism, revealing a left adrenal nodule.

The combination of lentigines, skin myxomas, cushingoid features, rare lip angiomyxoma, LCCSCT and hypercortisolism lead to the diagnosis of Carney Complex. More than two major criteria for diagnosis were met. Treatment included bilateral adrenalectomy. Pathology report confirmed PPNAD. PPNAD and LCCSCT are extremely rare tumors almost exclusively linked to Carney Complex. Interestingly, family history did not reveal endocrine disorders, cancers, or severe illnesses. Genetic testing for a de novo PRKAR1A gene mutation is pending.

EMS Provider Bias

◆ **Heather B**
Contributing authors: Lardaro T

Purpose: To investigate the potential existence of EMS provider bias regarding the three level 1 trauma centers in Indianapolis: Eskanazi, IU Health Methodist, and St. Vincent's. Additionally, we aim to investigate the correlation this may have with the number of EMS transports to each of these facilities, comparing several reasons for transport (e.g. medical vs. trauma).
Methods: Paramedics and EMTs working for IEMS were emailed the opportunity to participate in the study using a survey via REDCap. That data was complied, analyzed, and correlated to quarterly reports on number of transports to each of these major hospitals from IEMS.
Conclusion: Based on the results of this study, we will be able to determine if the bias present among EMS providers impacts the number of transports that they bring to each of these Indianapolis level 1 trauma centers. Indianapolis is uniquely suited for this study because it is one of the few locations with multiple level 1 trauma centers in the same city. EMS provider bias may have an impact on transports in this particular situation. Level 1 trauma centers require a certain number of transports to their hospital to retain their certification. Therefore, the conclusions of this study will be important to these centers and give them some direction for quality improvement.

An Atypical Presentation of Mucormycosis in an Immunocompetent Host

◆ **Neupane A**
Contributing authors: Grabek L, Hui Y

Purpose: Many patients often present to the ED with one problem and if admitted, subsequently develop a novel medical issue which can often be more diagnostically challenging even for the advanced clinician when the presentation is atypical. Herein we present one such clinical case of mucormycosis in a patient who complained of headache and unilateral vision loss with a nonspecific soft tissue mass on CT imaging that had no significant risk factors.
Methods: Chart review of a patient with a prolonged hospital course.
Results: The patient was not a candidate for surgical debridement due to the deep location of the mass. She was started on liposomal amphotericin B in the hospital for 2 weeks and switched over to an oral azole afterwards upon transfer to a skilled nursing facility. She passed away a few weeks later.
Conclusion: Because of the significant morbidity and mortality associated with this condition, prompt diagnosis and treatment are paramount. In our case, high suspicion of a nefarious process drove the treatment team to invasive biopsy faster, which clinched the diagnosis. Even with appropriate treatment, patients with mucormycosis suffer a high rate of morbidity and mortality.

Gardnerella Vaginalis Causing Pulmonary Infection in Young Adult: A Novel Case

◆ **Bittar, J**
Contributing authors: Gazzetta, J

Gardnerella vaginalis is an anaerobic, gram-variable bacterium primarily found in vaginal microflora of women. Previous reports of G. vaginalis cultured in men are few and have primarily been limited to the gastrointestinal and genitourinary tract. Few reports of G. vaginalis causing severe infections have been reported in the literature, including septicemia and two cases of perinephric abscess. There has been one previously reported case of G. vaginalis causing pulmonary complications that occurred in a male alcohol abuser. In our case review, we aim to demonstrate an unusual source of a pulmonary infection and highlight the importance of proper microbial isolation to guide treatment. Our patient is a young male who presented following multiple gunshot wounds including one to his head causing an intracranial hemorrhage, hydrocephalus, and a dural sinus thrombosis. His hospital course was complicated by a decline in neurological status treated with a craniotomy and external drain placement and multiple pulmonary infections. During his fever work-ups, he found to have G. vaginalis on mini-bronchoalveolar lavage and was subsequently treated with metronidazole. After treating his G. vaginalis pneumonia and other infectious sources, namely Haemaphilus influenzae and coagulase-negative staphylococcus pneumonias, his fevers and leukocytosis resolved and he was successfully discharged to a rehabilitation facility for neurologic recovery. To our knowledge, this is the second reported case of G. vaginalis isolated from a pulmonary culture and the first in a previously healthy, immunocompetent young male outside of the urinary tract.

Body Dysmorphic Disorder: Prevention, Detection, Treatment

◆ **Roesler A**
Contributing authors: Jager S, Karim A

A 46 year old female presented with worsening migraines for three months along with a history of anorexia, nausea, vomiting, confusion, lethargy, menorrhagia, epistaxis, hematochezia, and constipation. Renal biopsy showed thrombotic microangiopathy with patchy acute tubular necrosis and mild hyaline arteriosclerosis. No specific glomerular immune deposits or light chain restriction are seen by immunofluorescence microscopy. This renal biopsy showed the etiology was drug-induced thrombotic microangiopathy from phentermine use. A thorough history revealed that although she had a normal body weight, she was extremely concerned about her appearance and had a history of taking phentermine because of her body dysmorphic disorder. This case report will help others diagnose body dysmorphic disorder quicker in the future to avoid the many consequences of not treating it. Physicians should become more informed on body dysmorphic disorder to understand how to detect, treat, and prevent it in order to better advocate for women's health.

Sleep-Related Issues in Pregnancy

◆ **Prieto J**
Contributing authors: Richardson R, Bennett RD, Haas DM

Background: Sleep position during pregnancy has been associated with several adverse pregnancy outcomes such as gestational diabetes, preeclampsia, and late preterm birth. Although these associations have been established, less is known about sleep habits in pregnant women. The objective of this study was to characterize sleep during pregnancy.
Methods: An anonymous 14-question survey about position, disturbances, and duration of sleep was distributed to pregnant women in two clinics in Indianapolis, IN to determine what is predominant during pregnancy. The questions were developed through literature review and expert consensus. The survey was approved by the IRB.
Results: The mean age and gestational age for the 85 women surveyed was 28 years old and 25 weeks gestation. The racial/ethnic distribution was 50.6% black, 28.2% white, 15.3% Hispanic, and 3.5% other. 60% of women reported falling asleep on their left side and 35.3% reported falling asleep on their right side, but 41.2% and 40% of women reported waking up on their left and right sides, respectively. Most pregnant women surveyed sleep 6-8 hours (38.8%) and 4-6 hours (29.4%) and use extra pillows (66.7%) between their legs (48.2%) for comfort. 61.7% of the women had heard about or been talked to about different sleep positions during pregnancy and were equally likely to hear about it from a nurse, doctor, other healthcare provider, friend, family, or website. 32.9% of the women had been told they snore and 95.1% wake up during the night.
Conclusion: Of the pregnant women surveyed, most fall asleep on their left side and sleep 6-8 hours during pregnancy. The majority wake up in the middle of the night and one-third had been told they snore. Given the associations of poor sleep with adverse outcomes, sleep hygiene discussions should be a routine part of prenatal care.

Acquired Acrodermatitis Enteropathica (AE) after Enteral Nutrition in an Elderly Female

◆ **Bittar JM**
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Elderly women are particularly at risk for zinc deficiency, and accordingly, for AE. AE is a disorder of zinc metabolism, resulting from either impaired absorption or deficient intake, and manifests as erythematous, desquamative dermatitis, cheilitis and diarrhea. Zinc deficiency and patients on long-term enteral nutrition have been linked, indicating the need to supplement zinc or add it to tube feeding solutions. Dysphagia is a significant problem in elderly women, with one study showing that 72% of elderly women with no history of dysphagia failed a screening swallow study.

A 72-year-old female presented to dermatology clinic with 2-month history of progressive rash on her scalp, lips, oral mucosa, trunk, and extremities. One day prior, she had a feeding tube removed that was in place for 3 months for dysphagia. She reported severe weight loss from poor eating, but was otherwise asymptomatic. She had no recent medication changes.

On exam, her scalp, arms, chest, back, legs, feet and periorificial area had large ill-defined and well demarcated red, scaly thin plaques. She also had erosions on vaginal lips, and erythema in the perianal area and oral mucosa. Erythematous macules with peripheral scale were noted on the feet. Laboratory evaluation showed zinc-deficiency with a serum zinc level of 551 mcg/L (Reference Range 700-1200 mcg/L), while ferritin, 25-OH-vitamin D, and Vitamin B12 were within normal limits.

A diagnosis of acquired Acrodermatitis Enteropathica (AE) was made and treatment was initiated with zinc gluconate. Zinc levels returned to normal limits and skin lesions promptly resolved.

Dermatomyositis-Like Reaction in a Patient Treated with Etoposide

◆ **Bell MC**
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Drug-induced dermatomyositis (DM)-like reactions have been reported in association with use of a variety of medications. Diagnosis can be challenging due to variability in skeletal muscle involvement and overlapping clinical presentation with drug induced cutaneous lupus. We report a case of a 36-year-old Caucasian male with a history of stage IV Burkitt's lymphoma, in remission, and hemophagocytic lymphohistiocytosis (HLH) who presented to the clinic with a 4-month history of an intensely pruritic photo-distributed papulosquamous eruption. Onset of eruption was two weeks after the patient had undergone treatment with etoposide, dexamethasone, and IVIG for his HLH. He denied muscle soreness or weakness. Physical exam revealed bright erythematous plaques with overlying scale on the bilateral upper arms, neck, and central face involving the nasolabial folds. On biopsy, there was perivascular and periadnexal lymphohistiocytic infiltrate with interface dermatitis. Lab evaluation revealed a mildly low C4, negative ENA, and normal ANA and C3 values. Given the clinical presentation, biopsy results, and coincident administration of medications, amyopathic etoposide-induced DM was suspected. No further etoposide was administered and treatment with hydroxychloroquine was initiated to hasten resolution. Prior to beginning hydroxychloroquine therapy, the patient noted improvement in his rash. DM is a paraneoplastic syndrome in patients with malignancy, however this typically presents within 3 years of malignancy diagnosis. The strong temporal connection between cessation of the etoposide and resolution of the DM, further supports a drug induced etiology. In cases where there is no underlying malignancy or autoimmunity, patients should be evaluated for these conditions.

Delayed Tracheal Rupture After Thyroid Lobectomy

◆ **Svenstrup T**
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Purpose: To report the rare presentation of delayed tracheal rupture with subcutaneous emphysema 12 days after a thyroid lobectomy.
Methods: We present the history, physical exam, radiographic findings, intraoperative images, and management of a patient with delayed tracheal rupture after thyroid lobectomy. We also performed a related literature review of the presentation, risk factors, and management of patients with this condition.
Results: A 41-year-old female presenting with globus sensation and pressure during swallowing for several months is found to have a large benign thyroid nodule on fine needle aspiration. The patient subsequently underwent an uncomplicated right thyroid lobectomy procedure and was discharged to home. On postoperative day 12 the patient presented to the emergency department with acutely worsening severe anterior neck pain, a productive cough, and cellulitic skin changes. CT imaging showed soft tissue edema and subcutaneous emphysema in the thyroid bed extending from the supraglottic larynx to the sternal notch as well as glottic narrowing. The patient was immediately brought to surgery for exploration that found three areas of tracheal rupture between each of the first, second, third, and fourth tracheal rings. A tracheostomy was then placed below the rupture, wound irrigated, and the defect closed with a strap muscle flap. The patient was discharged without issue four days later, and direct laryngoscopy 16 days after the repair showed excellent healing of the rupture. The patient later had her tracheostomy removed without issue.
Conclusion: Delayed tracheal rupture should be suspected in post-operative thyroid lobectomy patients presenting with respiratory distress, coughing, and subcutaneous emphysema. Treatment can be achieved by muscle flap placement, primary closure, or tracheal resection when indicated.

Rapid Progression of Optic Nerve Sheath Meningioma During Surrogate Pregnancy

◆ **Burgett KM**
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Case: A 37-year-old woman presents for re-evaluation of painless, unilateral, vision loss that rapidly progressed during a surrogate pregnancy. She presented almost two years previously with vague symptoms of unilateral blurred vision. Ophthalmic examination revealed unilateral optic disc edema with good visual function (visual acuity 20/20, normal visual field). Despite MRI scanning suggestive of an optic nerve mass, she was diagnosed with idiopathic intracranial hypertension (pseudotumor cerebri). After physician consent, she proceeded with a planned surrogate pregnancy. Still carrying the diagnosis of pseudotumor cerebri, she underwent serial lumbar punctures as subtle decline in vision occurred. More substantial visual loss occurred during the third trimester (visual acuity 20/200), and in an attempt to salvage her vision, the patient underwent optic nerve sheath fenestration surgery following delivery. Post-operatively, her optic disc edema improved; however, her visual function remained poor. Repeat MRI scanning demonstrated impressive growth of an optic nerve mass in the orbital apex suggestive of optic nerve sheath meningioma. Due to the rapid growth of the mass, biopsy was recommended. Incisional biopsy via lateral orbitotomy confirmed WHO grade I optic nerve sheath meningioma. By time of definitive diagnosis, vision had declined to hand motions level. Radiotherapy was deferred.
Conclusions: Female sex hormones likely play a role in the biological behavior of meningiomas. In addition to being more prevalent in women, meningiomas commonly express progesterone receptors and may progress rapidly during pregnancy. Surrogate pregnancy presents a unique, high progesterone state that may exacerbate meningioma growth.
Clinical Significance: This case demonstrates rapid growth of an optic nerve sheath meningioma during a surrogate pregnancy. It is the first reported case of optic nerve sheath meningioma exacerbation associated with surrogate pregnancy.

Case Report on a Challenging Diagnosis of Infective Endocarditis

◆ **Roesler A**
Contributing authors: Bastin T, Jungels B, Offerle L

Background: This case report presents a unique presentation and diagnosis of infective endocarditis secondary to Bartonella infection in a patient with a history of truncus arteriosus. We hope that this report of his presentation and evaluation will help expedite the diagnosis in future patients with the same condition and expand the differential diagnosis for any patient with a similar presentation.
Methods: A 16-year-old male patient with a history of truncus arteriosus with Contegra, bovine jugular vein, RV-PA conduit and conduit replacement presented to the hospital with hepatosplenomegaly, pancytopenia, fatigue, weight loss, and emesis. The hepatosplenomegaly with pancytopenia were concerning for malignancy which led him to be transferred to the hematology/oncology service.
Results: A pediatric patient presented with pancytopenia, weight loss, fatigue, and hepatosplenomegaly. The team was very concerned for malignancy but the bone marrow biopsy showed no evidence. After ruling out many other diagnoses, the patient was diagnosed with infective endocarditis secondary to a Bartonella infection, which he was at high risk for due to his history of truncus arteriosus status post repair. Thanks to a thorough history, it was also revealed that he had exposure to cats at home.
Conclusions: The case report of infective endocarditis secondary to a Bartonella infection was consistent with other recent case reports in the literature. After an extensive evaluation, he was diagnosed with culture negative endocarditis secondary to Bartonella and started on doxycycline and rifampin prior to discharge. The most important factors to confirm this diagnosis were his elevated Bartonella IgG titer (>1:1024), vegetations seen on conduit on cardiac MRI, and splenomegaly.

The Role of Autonomy with Conjoined Twins Diagnosed at 9 Weeks

◆ **Gensel A**
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Purpose: American women have autonomy over their pregnancy including the right to have a legal and safe abortion. As providers we provide extensive counseling, but regardless of medical indication ultimately the patient decides her own pregnancy course. An early diagnosis of conjoined twins would provide additional time for women to choose.
Results: A 21-year-old G2P010 female presented at 9+0 weeks with an ultrasound revealing a monochorionic monoamniotic twin conjoined from thorax down with one heartbeat. They each had one arm arising laterally and lower limb buds that did not appear to be formed normally. The patient was counseled about the rarity of conjoined twins and that conjoined twins sharing one thorax and heart usually do not survive due to inability to be separated. Options for the patient were discussed included termination which was declined.
Conclusion: Our patient and many women are presented with the difficult decision of termination or carrying a pregnancy to term with questionable viability. A multitude of factors must be considered including personal beliefs and possible outcomes. Unfortunately, conjoined twins are likely to be stillborn or die shortly after birth. If separation of the fetuses is needed, there is a likelihood of one or two fatalities. If the pregnancy is successful, mothers face a lifetime of financial burden, need for ongoing care, risk for depression and anxiety, etc. A complicating factor in this decision is time as abortions are often limited to the first trimester depending on state laws. Conjoined twins are not normally diagnosed before 10 weeks gestation often giving women no more than 2 weeks to make this life altering choice. In this pregnancy, conjoined twins were diagnosed at 9 weeks. Earlier prenatal diagnosis of conjoined twins gives greater opportunity for counseling and gives extra time for women to consider options and execute their decision.

Cutaneous Crohn's Disease without Internal Involvement

◆ **Bittar J**
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Case: A 42-year-old woman presented to dermatology clinic with 2-year history of verrucous plaques on her buttocks that had progressed to involve the perineum and umbilicus. The lesions were minimally tender, but the patient was otherwise asymptomatic, specifically without diarrhea, abdominal pain or hematochezia. She had previously been evaluated by colorectal surgery, plastic surgery, and OB-GYN. Colonoscopy and endoscopy were without significant findings. Lesions were refractory to topical mupirocin and ketoconazole. Outside biopsy had suggested the diagnosis of verrucous carcinoma. On exam, her intergluteal cleft had a large verrucous plaque extending towards the perineum, with less verrucous plaques on the mons pubis and labia majora. The umbilicus and right inguinal fold had similar lesions also with malodorous drainage. Repeat biopsy showed focal suppuration, sinus tract formation, and small noncaseating granulomas in the superficial and deep dermis, consistent with the diagnosis of Cutaneous Crohn's disease (CC). Treatment was initiated with Infliximab, yielding significant improvement with pain and drainage.
Conclusions: We present an unusual case of cutaneous Crohn's disease without gastrointestinal involvement that was missed on initial biopsy. It is important to consider Crohn's in patients, especially women, with skin disease of the genitals/buttocks even in the absence of intestinal symptoms.
Clinical Significance: Two thirds of patients with CC are women. The majority of cases involve the genitals, and while it can precede intestinal disease by 3 months to 8 years, some patients never develop internal symptoms.1 Accordingly, studies have shown that Crohn's can have significant impact on female mental health, libido, and pregnancy. For these patients, depressed mood is a strong risk factor for low sexual function.2 Although women with quiescent disease have normal fertility outcomes, women with active disease during conception or have higher rates adverse pregnancy outcomes.3 Early diagnosis and coordination of care between specialties should be encouraged to optimize patient outcomes.

Elevated Troponin in Pregnancy: Heart Disease or Not?

◆ **Russell AF**
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Background: Cardiovascular disease is the leading cause of death in women in the United States. Diagnosis of acute coronary syndromes (ACS) is often times difficult to recognize in women, especially young women, as presentation can vary. A raised cardiac troponin level in a patient is concerning and suggests significant cardiac damage, as seen in myocardial infarctions. However, it has been demonstrated that troponins can be falsely elevated during pregnancy. Proper work-up and management is necessary in order to determine the true etiology of elevated troponins in pregnancy.
Case: A 21 year old G1P0 Caucasian female at 8 weeks gestation with a past medical history of a bicornate uterus, cervical somatic dysfunction, and tobacco use presented to the emergency room with chest pain and associated nausea, vomiting, lower abdominal pain, and vaginal discharge of bright red blood. She reported that she has had intermittent left sided chest pain for the past month. She states that the pain is non-radiating, feels like burning/pressure, and is 9/10 on pain scale at its worse. Her vital signs were within normal limits, except for an elevated heart rate to 115 bpm. No significant findings were found on physical exam. Transvaginal ultrasound showed fetal cardiac activity. Troponin was found to be elevated to 1.3 with no acute changes found on EKG or chest X-ray. She was admitted and her chest pain resolved with rest with troponins down trended to 1.25. Follow-up with her OB/GYN and cardiology suggested troponin elevation was due to pregnancy and she was advised to start low dose ASA going forward.
Discussion: Heart disease is a major cause of morbidity and mortality in women. Studies have shown that women are less likely to receive preventive treatment or guidance, such as lipid-lowering therapy, aspirin (ASA), and therapeutic lifestyle changes, than are men at similar ASCVD risk. Even though this patient had a falsely elevated troponin attributed to pregnancy, proper diagnostic work-up and management is necessary and can lead to better outcomes in CVD in women.

Management of Pediatric Extranodal Rosai Dorfman Disease in the Head and Neck: A Systematic Review

◆ **Campiti V**
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Purpose: To comprehensively analyze all reported cases of extranodal Rosai Dorfman disease (ENRDD) in children and analyze the clinico-pathologic characteristics and management outcomes.
Methods: The search terms "Rosai Dorfman Disease" and "Sinus Histiocytosis" were searched in the Ovid/Medline, PubMed, and Scopus databases from their inception through September 30th, 2018. Studies were systematically reviewed in accordance to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) scheme. All case reports and case series reporting on ENRDD in children less than 18 years of age and involving at least one head and neck subsite were included. Studies reporting on the isolated involvement of the eye, brain, or both were excluded.
Results: A total of 32 ENRDD cases were identified (24 male, 8 female) with ages ranging between 1.2 to 17 years (mean=12.15 years). Ethnicity was reported for 17 patients, with African Americans being the most affected group (n = 6). The most common head and neck site involved was the nasal cavity (n= 13, 40%), followed by the paranasal sinuses (n=10, 31%). The nasopharynx was involved in 5 patients (15%) as was the laryngo-tracheal complex. Concurrent cervical lymphadenopathy was present in 20 patients (62.5%). Additional non-otolaryngologic sites were simultaneously involved in 10 patients (n= 31.25%). Histopathology showed the presence of histiocytes or emperiopolesis in all patients. Surgery was the most common treatment modality and was performed in 19 patients (59.38%). , The next most common was steroid administration in 11 patients (34.36%). Loco-regional recurrence and persistence rates were lowest in patients who received surgery. In 11 instances (34.36%), ENRDD was misdiagnosed for another pathologic process.
Conclusion: ENRDD is rare in the pediatric population with a high rate of delayed diagnosis and misdiagnosis. This review compiles the largest number of patients to date and suggests surgical management is the treatment of choice in these patients.

Early Engagement Has a Sustained Positive Impact on Medical Students' Perceptions of Surgical Careers

◆ **Virtanen PS**
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Purpose: Prior studies have demonstrated that brief, early medical student exposure to surgery is effective and creates positive perceptions of surgical careers. Opportunities for preclinical medical student exposure to surgery are not universally available nor are the long-term effects well-understood. Our aim was to determine the impact of early exposure to surgery on perceptions about surgery and the decision to consider pursuing a surgical career.
Methods: Our institution's Surgery Student Interest Group created a trauma surgery shadowing experience. Immediate (n=109) and 1-year (n=77) follow-up surveys were sent to participants from the study period (December 2016-July 2018). Data gathered included demographics, student perceptions about surgery, and the experience itself.
Results: 59 immediate surveys (54.1%) and 24 1-year follow-up surveys (31.2%) were returned. Of the 59 immediate responses, 55.9% (n=33) were female, 93.2% were first and second-year students (n=55), and 94.9% (n=56) would recommend the experience to a peer. Significantly more immediate responders were considering a career in surgery after the experience compared to before the experience (69.5% vs 61.0%, p=0.012). This was particularly evident in female responders (72.7% vs 57.6%, p=0.0112). The experience was felt to be relevant to the career choice process by 94.9% of students immediately after and 92.2% at 1-year follow up (p=0.90). At immediate follow up, 96.6% (n=57) of students recalled a specific trauma team member who made a positive impression on them and this was sustained (87.5%, n=21) at 1-year follow up (p=0.142).
Conclusion: Students reported a positive impact on their perceptions of, and were significantly more likely to consider, a career in surgery after the experience. Student recall of the personal connection made to the trauma team is sustained over a 1-year period. Early, informal shadowing experiences may increase interest in surgical careers, particularly for female students, and this engagement appears to be sustained over time.

Systematic Review of Metastatic Glomus Tumors: Immunohistochemical Characteristics and Outcomes

◆ **Hegde, K**
Contributing authors: Bittar J, Jason C, David C, Groh E

Background: Consensus guidelines do not exist for the diagnosis and surgical management of metastatic glomus tumors. Our objective was to compile all data on the characteristics and outcomes of metastatic glomus tumors.
Methods: A systematic review of PubMed, Web of Science, Cochrane, Excerpta Medica database (EMBASE) was performed to identify all cases of metastatic glomus tumors.
Results: Of the 809 abstracts from the literature search, 26 manuscripts with 35 metastatic glomus tumors met inclusion criteria. Location of primary tumor was commonly soft tissue (45.7%, 16/35), lung 22.9% (8/35), and stomach 17.1% (6/35). 39.3% (11/28) reported metastasis at initial presentation. Immunohistochemistry results showed 100% positivity for smooth muscle actin (22/22), vimentin (13/13), and p53 (3/3), and 91.7% (11/12) for collagen IV. Negativity was 100% for S100 (16/16) and cerium ammonium molybdate 5.2 (5/5); 94.4% for cytokeratin (17/18), and 93.3% (14/15) for CD34. Resection of the primary tumor was performed in 88.2% (30/34) of cases. Lung was the most common site for metastasis (42.9%, 15/35), followed by brain (25.7%, 9/35), soft tissue (20.0%, 7/35), liver (17.1%, 6/35), intestine (17.1%, 6/35), lymph nodes (17.1%, 6/35), and bone (14.3%, 5/35). Other less common sites included the spleen, heart, adrenal glands, mesentery, kidney, peritoneum, thyroid and stomach. The average follow-up was 54.1 months. Rates of local recurrence (LRR) and mortality (MR) were 32.1% (9/28) and 63.3% (19/30), respectively.
Conclusions: Metastatic glomus tumors have high LRR and MR. Soft tissue was the most common primary site and lungs were most common site of metastasis. IHC findings showed high rates of positive staining for SMA, vimentin, p53, collagen IV and low rates for desmin, S100, CAM 5.2, cytokeratin, and CD34. The IHC profile may help diagnose glomus tumors with metastatic potential. More complete data are necessary to develop consensus guidelines for diagnosis and management of metastatic glomus tumors.

CRISPR/Cas9 Generated FGFR3 Knockouts in Keratinocyte Models of HPV Infection

◆ **May A**
Contributing authors: DeSmet M, Jose L, Androphy E

Purpose: Generate Fibroblast Growth Factor Receptor 3 (FGFR3) knockouts in keratinocyte models of HPV infection and observe how this may affect the viral lifecycle.
Methods: We utilized CRISPR/Cas9 to create FGFR3 knockouts in keratinocyte cell lines commonly used to model HPV infection. Western blot was used to determine whether knockout generation was successful. In lines where FGFR3 knockout was confirmed, quantitative PCR (qPCR) was used to measure viral copy load. To study FGFR3's potential effect on viral integration, qPCR was coupled with exonuclease digestion that degraded genomic DNA while leaving the viral episomal DNA unaltered. By comparing the quantity of DNA between digested and undigested samples, we can approximate differences in integration rates between experimental groups.
Results: FGFR3 knockout generation was successful in the CIN612 cells, a line of HPV-31 infected cervical keratinocytes. The remaining cell lines either did not tolerate the FGFR3 knockout or demonstrated continued FGFR3 expression on western blot analysis. Quantification of HPV DNA in the CIN612 cells did not show a change in viral copy number between knockout and wildtype groups. However, quantification of DNA with and without exonuclease digestion showed a possible trend towards increased viral integration in FGFR3 knockout CIN612 cells.
Conclusion: FGFR3 function appears to be necessary for the growth and survival of several keratinocyte models of HPV infection, making the generation of FGFR3 knockouts in these lines impractical. In cell lines where CRISPR/Cas9 knockout was unsuccessful, future studies may need to employ siRNA to simulate loss of the FGFR3 gene. Based on early observations of the successfully edited CIN612 cells, FGFR3 knockout does not appear to change the rate of HPV replication. However, FGFR3 may play a role in preventing viral integration, as knockout cells had a lower proportion of DNA remaining after exonuclease digestion of genomic linearized DNA than wildtype cells.

Improving Modifiable Health Outcomes in Uninsured Women Living in Rural Indiana

◆ **Prieto J**
Contributing authors: Borse V, Swanson K, Abernathy MP

Case: A 27-year-old G5P0221 woman with a history of poor pregnancy outcomes, episodes of diabetic ketoacidosis, cardiac arrest, and digit amputations due to poorly controlled diabetes presented with preeclampsia. Fetal ultrasound findings at 14 weeks were consistent with caudal regression syndrome. Glycosylated hemoglobin was 9.0% at the start of pregnancy. Social history is significant for unemployment, limited medical access in rural Indiana, and lack of insurance when not pregnant. She reported inability to afford insulin and often goes without it. The infant was delivered at 35 weeks and 3 days due to preeclampsia, required prolonged hospitalization, and will require multiple surgeries.
Conclusions: Perinatal risk factors such as lack of prenatal care, smoking, illicit substance abuse, and uncontrolled medical conditions account for 45-50% of infant deaths in Indiana annually. These risk factors can be modified with insurance and educational programs. Detecting and treating diabetes early by optimizing glycemic control before pregnancy can improve Indiana's infant mortality rate, ranked 7th highest in the US. Women who attend diabetes education programs have fewer adverse events, smoke less, and are less likely to take teratogenic drugs. However, many non-pregnant women living in poverty cannot afford insulin because they lack insurance, and the cost of insulin rose $2,864 from 2012 to 2016.
Clinical Significance: This case demonstrates the role that modifiable social determinants play on women's and infants' health. Decreasing adverse outcomes before, during, and after pregnancy by providing insurance coverage and creating educational programs would be more cost effective than long term care of a disabled infant or mother on Medicaid. To improve the lives of mothers and infants in Indiana, forward thinking policy planners must balance upstream costs of controlling medical conditions with downstream costs of consequences from pregnancy with uncontrolled medical conditions.

Treatment of Hirschsprung Disease in the Developing World: A Series of Six Cases

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Purpose: In the developed world, Hirschsprung Disease (HD) is generally diagnosed and treated in the first year of life. However, in the developing world, HD frequently goes without a diagnosis for years and without treatment for even longer. This case series discusses the presentation and treatment of a series of six cases of HD in the developing world.
Methods: Six individuals with HD, ages 20 months to 10 years, presented to a mission hospital in Togo, West Africa. These individuals presented late with HD having varying workups based on availability of resources. Each patient was diagnosed due to chronic constipation, lack of stooling, or obstruction, leading to either biopsies or enema studies to confirm HD. All patients had ostomies placed to prevent further disease complications from poor stooling. Quality of life was negatively impacted with ostomy placement as cleanliness was an issue. The necessary definitive surgical treatment was unobtainable due to financial constraints or lack of skilled providers.
Results: A modified Swenson procedure was performed on all individuals in order to definitively treat HD. In this procedure, the original ostomy was divided into a healthy, proximal segment and a distal, aganglionic segment. The distal segment was dissected down into the rectal vault. Next, a transanal dissection was started and the rectal wall was incised approximately 1-1.5cm above the dentate line. This circumferential incision was continued proximally until it reached the upper rectal dissection. The aganglionic segment was removed and the healthy proximal limb was anastomosed to the rectum creating a functioning large bowel. Diverting ostomies were placed to allow stress-free healing for two months at the anastomosis, then the ostomies were taken down.
Conclusion: The modified Swenson procedure is an excellent definitive treatment for HD in the developing world.

Looking Beyond BMI: Uncovering Eating Disorders and Nutritional Deficiencies in Obese Adolescent Females

◆ **Sawyer K**
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Case: A 13-year-old girl with no significant medical history presented with tooth pain and was diagnosed with an abscess and osteomyelitis of the jaw. During her admission, she was also found to have a hemoglobin of 4.8 g/dl and an MCV of 51 fL. Further studies were consistent with severe iron deficiency anemia. After obtaining additional history, the patient was noted to have minimal iron intake due to a self-restricted diet in the setting of body image issues. With normal body mass index (BMI) at the time of her admission and no readily available previous weights recorded, her recent 10% weight loss and risk factors for iron deficiency and malnutrition were not initially apparent to clinicians.
Conclusions: This patient's severe iron deficiency anemia was likely caused by poor dietary intake in an effort to lose weight. Dietary deficiencies and eating disorders are difficult to identify in patients who present with normal to elevated BMI, thus clinicians need to maintain a high level of suspicion in adolescents with risk factors.
Clinical Significance: Overweight and obese women are at increased risk for unhealthy dieting strategies and iron deficiency anemia compared with their peers. While all adolescent females require greater iron intake due to an increase in muscle mass, blood volume, and the onset of menses, obesity is an additional and lesser known risk factor. A higher incidence of unhealthy weight control behaviors such as skipping meals, taking diet pills, and inducing vomiting may partially explain the increased risk for iron deficiency in overweight adolescents. Additionally, there is evidence of iron dysregulation in obesity due to inflammation and impaired iron absorption. Patients with normal to high BMI should not be overlooked in screening for disordered eating and dietary deficiencies including iron deficiency anemia.

Clinical Presentation and Findings on Diagnostic Imaging in Creutzfeldt-Jakob Disease

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Creutzfeldt-Jacob Disease (CJD) is a rare transmissible spongiform encephalopathy that is uniformly fatal. This disease is characterized by the pathologic accumulation and deposition of an abnormally misfolded form of the host-encoded cellular prion protein. This accumulation leads to neuronal degeneration, astrogliosis, and characteristic spongiform change. This disease has an incidence of 1 per million and usually occurs spontaneously; however, a small number of patients will inherit the condition. Our patient is a 73-year-old female who presented with frequent bouts of coughing, gait difficulty, and memory complaints which had progressed over a 3-month time period. Her family stated that her symptoms seemed to correspond to a recent middle ear infection with associated vertigo. These symptoms were exacerbated by a recent fall which resulted in injury to her hip. Prior to this, she was independent and working full time. Initial MRI at an outside facility was non-specific and showed isolated T2/FLAIR hyperintensity of the basal ganglia with associated restricted diffusion, and a differential included possible carbon monoxide poisoning or infectious etiology. Lumbar puncture was performed for presumed encephalitis or inflammatory etiology; however, the results, including cultures, were grossly normal aside from elevated protein and glucose. Follow-up imaging three months later showed persistent restricted diffusion, most prominent within the caudate, putamen, thalamus, and parafalcine cortex bilaterally, which in conjunction with clinical history, was concordant with sporadic Creutzfeldt-Jakob Disease. Following these imaging findings, repeat lumbar puncture results showed positive RT-quaking-induced conversion (RT-QuIC), total tau protein >4000 pg/ml, and positive 14-3-3 protein. In combination, the findings were consistent with a diagnosis of probable CJD. In this report, we discuss her case as well as briefly review the typical clinical course, neuroimaging, and pathogenesis of CJD.

Stereotactic Body Radiation Therapy (SBRT) for T1 and T2 Medically Inoperable NSCLC in a Community Setting

◆ **Jenks C**
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Purpose: Stereotactic Body Radiation Therapy (SBRT) is considered for definitive treatment of medically inoperable T1 or T2 non-small cell lung cancer (NSCLC). This study analyzes the local control (LC), progression-free survival (PFS), and overall survival (OS) of a large community series of patients, including factors that influence these survival distributions.
Methods: Between September 2012 and December 2017, 240 patients were treated for inoperable stage T1 or T2 NSCLC. 144 patients had T1 tumors, and 96 patients had T2 tumors. Patients received either a 5-fraction regimen of 50 Gy or less (86 patients) or 60 Gy (148 patients), while six received 3-fraction regimen of 54 Gy. Survival was measured via the Kaplan-Meier method to determine LC, PFS, and OS. Tumor, demographic, and patient characteristics were analyzed for impact on survival and toxicity.
Results: Median follow-up of all patients was 23 months (range 1-83 months). Grade 3 pneumonitis was observed in 2 patients, both in tumor sizes over 3 cm. No other grade 3 or higher adverse events were reported. Grade 2 or higher hemoptysis was not identified. Six patients experienced a local recurrence; 3-year LC was 97%. 31 patients experienced any location recurrence; 3-year PFS was 84%. Median OS was 48 months and was significantly higher for T1 versus T2 tumors (p=0.002). OS was significantly higher in patients treated with 60 Gy versus 50 Gy (p=0.006). No other factors were identified that significantly impacted OS, LC, or PFS.
Conclusions: SBRT is an effective treatment for medically inoperable T1 or T2 NSCLC patients treated in the community setting, with high levels of LC and PFS, and minimal toxicity. Dose escalation to 60 Gy when using a 5-fraction regimen resulted in higher OS, especially for T1 tumors, with no higher toxicity.

Skin Sympathetic Nerve Activity in Patients Undergoing Cardioversion

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Purpose: To investigate the effects of cardioversion and deep sedation on skin sympathetic nerve activity (SKNA) using neuECG methodology.
Methods: We recorded concurrent ECG and SKNA using one of two neuECG devices in 11 patients undergoing deep sedation with propofol administration and subsequent cardioversion for atrial fibrillation. The recorded signals were analyzed and bandpass filtered from 500-1000 Hz to show SKNA and eliminate muscle interference. The average voltage of SKNA (aSKNA) was then calculated.
Results: Of the recorded patients, 10 converted to sinus rhythm after cardioversion. Compared to aSKNA at baseline (1.1132 ± 0.2562μV), cardioversion significantly increased aSKNA (2.9102 ± 1.2938μV, $p<0.01$). 5 s aftershocks were delivered. Furthermore, each shock caused an initial burst of nerve activity followed by a second burst 2 s later. Deep sedation with propofol significantly suppressed aSKNA for at least 10 min after the last cardioversion shock (1.11 ± 0.25μV to 0.89 ± 0.36μV 5 min after injection, $p<0.01$).
Conclusion: In all patients who received a cardioversion shock, SKNA was transiently increased after the shock. Deep sedation with propofol decreased SKNA for at least 10 min after the last cardioversion shock. Deep sedation may have antiarrhythmic effects, which might help prevent immediate recurrences of atrial fibrillation after successful cardioversion.

Small-Group Activity to Reinforce Concepts in Acid-Base Physiology

◆ **Islam S**
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Purpose: To improve first-year medical students' understanding of acid-base physiology by introducing a small-group active learning exercise that stimulates discussion of underlying renal physiology as it pertains to acid-base handling, in the hopes of establishing a foundational understanding of the mechanisms involved.
Methods: Following an overview lecture on acid-base physiology, small groups of 4-5 students addressed questions based on 3 clinical cases. Students were asked to diagram nephron segments, illustrate and describe the function of regional transporters, channels, and paracellular movement, address the action of key enzymes and hormones, and make clinical correlations that included identification of patients' acid-base status. The exercise concluded with a series of rapid-fire review questions relating to acid-base imbalances (respiratory and metabolic). Learning strategies utilized in this activity included small group collaboration and elaboration through discussion.
Results: A pre- and post-concept quiz was administered to assess the impact of the exercise on student understanding of key concepts in acid-base evaluation. We found a significant difference in pretest and posttest scores; the average preconcept quiz score was 4.57 out of 6 while the average post-concept score was 5.30 out of 6 (n=56; p<.001). Based on frequency of Likert scale responses in a post-session survey, we learned that most students regarded the session as moderately helpful in clarifying lecture concepts and the rapid-fire questions as highly helpful in improving their ability to analyze acid/base status.
Conclusion: This acid-base exercise was an effective way to help students synthesize and apply the concepts introduced through lecture by allowing them to engage with the material and each other while reinforcing basic science principles. Qualitative data suggests that more content focusing on nephron segments and their anatomic components would be a welcome addition for students in the future.

Social Cognition in Women with Schizophrenia and the Potential of Oxytocin in Treatment

◆ **Tai M**
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Purpose: To investigate the effects of oxytocin on social cognition in women with and without schizophrenia.
Methods: We recruited twenty-seven women with schizophrenia and thirty-eight female healthy controls for a randomized, double-blind, placebo-controlled, cross-over study in which participants received 40 IU of intranasal oxytocin or saline placebo on two testing days several weeks apart. To measure social cognition, we used The Awareness of Social Inference Test (TASIT), which is divided into three parts that each test a progressively more complex aspect of social cognition: Emotion Evaluation Test (EET), Social Inference-Minimal (SI-M), and Social Inference-Enriched (SI-E). The task consists of a series of video clips depicting actors engaging in various types of social interactions, followed by questions that require social inferences.
Results: Women with schizophrenia performed worse than controls on all three social cognition tasks on placebo day: EET ($d = 0.71$, $p = 0.006$), SI-M ($d = 0.64$, $p = 0.035$), and SI-E ($d = 0.96$, $p < 0.001$). There were no significant Drug (oxytocin, placebo) x Group (schizophrenia, control) interactions for EET ($F(1, 61) = 0.28$, $p = 0.6$), SI-M ($F(1, 46) = 0.04$, $p = 0.85$) or SI-E ($F(1, 62) = 0.03$, $p = 0.85$). The dosage of anti-psychotic medications taken by women with schizophrenia, as measured by chlorpromazine equivalents, significantly moderated the effect of oxytocin on performance in the SI-E in that group. Patients taking higher equivalents of chlorpromazine showed less improvement with oxytocin in their scores in the SI-E than patients taking lower equivalents ($r(-0.447)$, $p = 0.025$).
Conclusion: Women with schizophrenia, compared to controls, have more impaired social cognition as measured by TASIT. Oxytocin does not impact performance in either group. Patients taking higher dosages of anti-psychotic medications show less improvement with oxytocin in more complex aspects of social cognition than patients taking lower dosages.

Retinal Oximetry and Ocular Perfusion Pressure Between Subjects of European Versus African Descent

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Purpose: To investigate the relationship between oxygen saturation in the retinal vessels and ocular perfusion pressure in healthy subjects of European (ED) and African Descent (AD).
Methods: 46 healthy subjects (35 ED, 11 AD) were assessed for retinal oximetry data (oxygen saturation in the retinal arteries and veins, mean arteriovenous (AV) difference in oxygen saturation) by non-invasive spectrophotometric retinal oximetry (MutliSpec Patho-Imager), for blood pressure (BP) by an automated ambulatory blood pressure monitor, and for intraocular pressure (IOP) by Goldmann applanation tonometry. OPP was calculated from BP and IOP. Pearson correlations were used to test for associations between measurements.
Results: The mean AV difference in oxygen saturation was $35.41 \pm 5.58\%$ in the healthy subjects of ED, and $37.95 \pm 6.37\%$ for the subjects of AD ($p=0.254$). The mean OPP was 48.71 ± 6.55 mmHg in the healthy subjects of ED, and 54.96 ± 8.99 mmHg for the subjects of AD ($p=0.052$). There was a negative and significant correlation between AV difference and OPP in ED subjects ($r=-0.39$, $p=0.020$), and a positive and significant correlation in subjects of AD ($r=0.721$, $p=0.012$), leading to a statistically significant difference between the two groups ($p=0.0101$).
Conclusions: Our data suggests that the relationship between retinal oximetry and OPP may differ between individuals of different racial groups. The positive correlation found in AD subjects suggests possible disruption in oxygen extraction and may explain racial disparities in ocular health.

Theoretical Predictions of Oxygenation in a Heterogenous Vascular Network of the Retina

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Background: Glaucoma is the leading cause of blindness in the United States, affecting over 2 million people (1.86%). In primary open angle glaucoma (POAG), there is an increased resistance to aqueous outflow through the trabecular meshwork related to elevated intraocular pressure (IOP) causing retinal ganglion cell death, although the exact etiology has yet to be discovered. Recently, it has been shown that retinal blood flow may contribute; however, retinal blood flow is complex and contains a heterogeneous geometry of microvessels, which may lead to inaccurate predictions of oxygenation of the retinal tissue.
Methods: From confocal microscopy of mouse retina, a realistic mathematical model was studied representing interactions among vessels and tissue in a vascular network with non-uniform geometry. Oxygen diffusion in tissue is equated to oxygen consumption in tissue, and the resulting oxygen concentration at any tissue point is calculated by summing the oxygen fields produced by each of the surrounding blood vessels.
Results: Figure 1: Panel A shows the model-predicted contour map of the oxygenation of the arteriolar network and surrounding tissue under well-oxygenated conditions (incoming arterial saturation to all branches is 96%). In Panel B, the inflow saturation in one of the six arteriolar branches is reduced by 66%, decreasing the average tissue PO_2 in the entire network from 67.2 mmHg to 61.7 mmHg and the minimum tissue PO_2 from 18.7 mmHg to 8.1 mmHg, nearly a 57% reduction in tissue oxygenation.
Conclusions: This model allows, for the first time, more accurate predictions of retinal oxygenation in response to changes in oxygen demand, arterial saturation, viscosity, or hematocrit. Despite reasonable average PO_2 levels overall, many terminal arteriolar vessels will have abnormally low PO_2 levels, which can lead to areas at risk of hypoxia—an effect that would not be observed in a non-heterogeneous description of the network.

Reasons for Discontinuation of Apixaban or Rivaroxaban in Patients Diagnosed with Acute Venous Thromboembolism

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Purpose: Monotherapy oral anticoagulation in the home treatment of patients with low risk venous thromboembolism (VTE) is gaining acceptance. It remains necessary to document patient-centered reasons for treatment discontinuation. We report categorical reasons for discontinuation of rivaroxaban or apixaban prior to completion of treatment in patients discharged from the Emergency Department with low risk VTE.
Methods: We used a prospective, multicenter observational study, in which low risk subjects diagnosed with acute VTE (n=41 with PE) were treated with either apixaban or rivaroxaban for treatment. Subjects were low risk using Hestia criteria or clinician judgment and sPESI and were enrolled between July 2017 through December 2018. Outcomes were assessed by phone and medical record review of each subject following 30 days after discharge from the Emergency Department. Subjects who discontinued treatment prior to completion were asked for a categorical reason for discontinuation: 1. bleeding, 2. other side effect, 3. change in diagnosis, 4. Physician discretion, 5. worsening clot burden, 6. cost/insurance preference, 7. other.
Results: A total of N=203 subjects have been enrolled in the study including 37 treated with apixaban and 167 treated with rivaroxaban. Of the 203 subjects enrolled, 19 (9.4%) reported discontinuation of treatment prior to completion. The number of subjects reporting categorical reasons for discontinuation are as follows: bleeding, 4 (2.0%); other, 4 (2.0%); worsening clot burden, 3 (1.5%); cost/insurance preference, 3 (1.5%); other side effect, 3 (1.5%); change in diagnosis, 1 (0.5%); Physician discretion, 1 (0.5%). The most common forms of bleeding were hemoptysis (n=2) and menorrhagia (n=2). The main categorical reasons for discontinuation of treatment in subjects treated with apixaban and rivaroxaban were cost/insurance preference and bleeding, respectively.
Conclusion: Discontinuation of monotherapy anticoagulation is a significant problem in patients with low risk VTE treated as outpatients. The most common reason for discontinuation was bleeding.

The Ripple Effect – Analysis of the Cascade of Events Associated with Peripheral IV Loss and the Impact on Nurse Workflow and Resource Utilization

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Purpose: Peripheral intravenous catheters become dislodged and fail for a variety of reasons, consuming nursing time and hospital resources. Little research has been done to evaluate IV failure on a case-by-case basis to determine the clinical and financial impacts. The primary objective of this study is to characterize the costs for an IV dislodgement in a general medical hospital.
Methods: A prospective study of adult inpatient IV dislodgements and replacements (n = 51) were performed. Vascular access nursing staff filled out post-dislodgement surveys seeking demographics, causes of the dislodgement, disruption of care, time/resource utilization, and other factors. Time costs were based on Bureau of Labor Statistics average salary data. Resource costs were obtained from Deaconess Health System. Data was analyzed using Microsoft Excel.
Results: The average cost to reestablish a dislodged IV was $47.58 (Range $22.28 - $190.50). 74.6% of costs were due to supply utilization. The average time spent by an RN was 18 minutes, and the average number of sticks was 1.3. The average patient was 66.7 years old, with 54% of patients being male. Patients went, on average, 55 minutes without IV access (range 5-440 minutes). The plurality of dislodgements were due to patient "cognitive issues", followed by "patient transfers" and "other/nonclassifiable'. 50.4% of dislodgements occurred on medical critical care units, and 27.3% occurred in surgical units.
Conclusions: Dislodgements are more common in patients with cognition problems, on medical units and in the elderly. Due to Deaconess Health System utilizing a specialty vascular access team, the data presented may be an underestimation when compared to hospital systems using direct patient care nurses. This study represents a best-case scenario of IV reestablishment. Further study is warranted to investigate possible solutions to intravenous catheter dislodgement, with special attention to patients with cognitive issues or cognitive decline.

Facing the Risks of a Large Acoustic Neuroma Resection

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Case: A 17-year-old female was referred to our neurotology skull base center with progressive right-sided hearing loss, tinnitus, disequilibrium, and worsening headaches. She was found to have horizontal nystagmus, decreased corneal reflex, and right-sided profound deafness. Her family history was negative for neurofibromatosis type 2. A brain MRI revealed a giant 3.6cm x 4.3cm x 4.0cm right vestibular schwannoma (VS; also known as acoustic neuroma) with massive brainstem compression. VS are benign but can cause hearing loss, brainstem compression, and neurologic sequelae when large. Due to the tumor size and her young age, surgical resection was recommended. A large risk of acoustic neuroma surgery is facial nerve injury due to the severe stretching of the nerve from the tumor. During the 16 hour surgery via atranslabryinthine approach, the tumor was successfully freed from cranial nerves 5, 7, 9, and 10. Her immediate postoperative facial nerve function was normal. Two years after surgery, her MRI shows no brainstem compression and her facial nerve is normal. She is now in college studying nursing.
Conclusions: VS are Schwann cell-derived tumors that arise from the vestibular portion of cochleovestibular nerve. The overall incidence of VS is 1 per 20,000 people per year and a median age at diagnosis of 50. Young patients typically present with larger, growing tumors.
Clinical Significance: Given the tumor size, major stretch/compression of the facial nerve occurred, increasing the risk of facial paralysis after surgery. Facial paralysis is socially and functionally devastating, happening in >20% of large acoustic neuroma surgeries. Facial paralysis leads to difficulty eating, sequelae of the inability to close her eye, and altered facial appearance. However, watchful waiting here is not recommended given her young age and brainstem compression. Experienced team approach at high volume centers can lead to excellent outcomes.

Transjugular Intrahepatic Portosystemic Shunt (TIPS) Creation to Improve Surgical Candidacy Prior to Abdominal Operation

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Purpose: TIPS creation is typically reserved for patients with refractory ascites or variceal hemorrhage. While TIPS has also been created prior to planned abdominal operation to decrease morbidity related to portal hypertension, there is little in the literature supporting its efficacy in that indication. The goal of this study was to determine if preoperative TIPS creation allows successful abdominal operation and improves outcomes.
Methods: A retrospective review of records of 22 patients who underwent preoperative TIPS creation between 2011 and 2016 was performed. Clinical and serologic data were obtained for 21 patients because one patient was completely lost to follow up after TIPS creation. The primary endpoint was whether patients underwent planned abdominal operation following TIPS. Operative outcomes and reasons that patients failed to undergo planned operation were examined as secondary endpoints.
Results: The mean age was 56.4 ± 8.8 years, and the mean Child-Pugh and Model for End-Stage Liver Disease (MELD) scores were 7.2 ± 1.5 and 11.9 ± 4.3, respectively. Thirty-day mortality after TIPS creation was 9.5%. Eleven patients (52.4%) underwent planned abdominal operation and the thirty-day postoperative mortality rate was 0%. One of these 11 patients (9.1%) had recurrent ascites and developed a surgical site infection after operation that required drain placement. Reasons for failure to proceed to abdominal operation after TIPS included resolution of hernia symptoms, development of malignancy, TIPS revision, transportation issues, and death. In three cases the reason for cancellation of the surgical procedure was unknown.
Conclusion: In our population, TIPS allowed successful abdominal operation in the majority of patients, with thirty-day TIPS mortality of 9.5%, no perioperative mortality, and 9.1% major postoperative morbidity.

A Patient's Voice Guides Treatment of Pregnancy-Associated Breast Cancer

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Purpose: Incidence of pregnancy-associated breast cancer (PABC) is increasing internationally, and treatment involves difficult decision-making with no clear guidelines. Open, honest communication is crucial for identifying patient values, and delivery of care should be tailored to each individual patient.
Case: A 35-year-old previously healthy female noticed a mass in her right breast. Imaging and core biopsy showed grade 2 triple negative invasive ductal carcinoma (cT2N0M0). A positive beta-hCG test confirmed the patient's suspicion that she may be 5-6 weeks pregnant. The patient faced the choice to end the pregnancy or wait until the 2nd trimester, when it would be safer for the fetus, to receive neoadjuvant chemotherapy. The patient's desire to stay alive for her 5-year-old son strongly guided her decision to not delay treatment. After consultation with Maternal Fetal Medicine and careful deliberation, the patient and her husband decided to terminate the pregnancy surgically in order to quickly proceed with standard of care chemotherapy. The patient went to Planned Parenthood for her abortion because, even with private insurance, it was significantly more expensive to terminate the pregnancy in the hospital. After chemotherapy, she had a bilateral mastectomy with sentinel node biopsy. Pathology showed complete pathologic response, and she remained recurrence-free after 18 months. Although treatment came with the risk of permanent menopause, her menses returned a year later. She was assured that her risk of breast cancer recurrence would not be increased with subsequent pregnancy.
Conclusions: The patient's complete remission was made possible through the excellent coordination of care between her multidisciplinary medical team and Planned Parenthood. Her priorities were clearly identified and understood by all parties—enabling coordinated and compassionate care aligned with her goals.

Beta Blocker Provoked Psoriasis: A Rare Exacerbation of Psoriasis in a Middle-Aged Woman

◆ **Haddad FC**

Background: Beta blocker provoked psoriasis (BBPP) is a rare condition characterized commonly by psoriasiform eruptions. Its presentation is subacute and seen in patients 1-18 months after the start of beta blocker therapy. Symptoms include exacerbation of current psoriatic lesions and/or the development of new lesions that can deteriorate into erythroderma. Management includes discontinuation of beta blocker, addition of topical and systemic agents, and prevention of transdermal fluid loss. However, beta blocker discontinuation rarely results in full resolution of symptoms.
Results: This case report is the presentation of BBPP in a 59-year-old African American female who started metoprolol two months prior for hypertension. She presented with a three-month history of a worsening, pruritic, nummular, and targetoid rash that covered 100% of her body surface area. Skin biopsy revealed psoriasiform dermatitis. The patient underwent triamcinolone wet wraps, fluid resuscitation, and discontinuation of metoprolol and was discharged on topical agents and hydroxyzine. Two month post discharge recovery showed mild xerosis, which was managed with cyclosporine.
Conclusions: Identifying and understanding BBPP is important due the prevalence of prescribed beta blockers. By being aware of the etiology and symptoms of BBPP, providers can be able to prevent and treat this phenomenon accordingly.

Association of Adverse Childhood Experiences, Attachment Styles, and Depression Symptoms in an At-Risk Perinatal Population

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Contributing authors: Li W, Chambers J, Dang D, Daggy J, Haas D

Purpose: To examine the association of a woman's childhood trauma experience and attachment style with depression symptoms in the perinatal period for a population of inner-city women.
Methods: This is a cross-sectional pilot study of pregnant and postpartum women (up to 6 weeks postpartum) collected during a 3-month period. Specific questionnaires that assessed adverse childhood experiences (Adverse Childhood Experience survey – ACE), attachment (Experiences in Close Relationships-Relationship Structures – ECR-RS), and depression (Edinburgh Postnatal Depression Scale – EPDS) were completed during a woman's obstetric or postpartum visit.
Results: Of the 161 women in the final cohort, 36 (22.4%) were categorized as depressed with a score of ≥ 10 on the EPDS. ACE score was found to be an independent predictor of EPDS when EPDS was treated as continuous or categorical (OR 1.27, 95% confidence interval 1.08–1.49) while adjusting for covariates. Some ECR-RS subscales were also significantly associated with depression.
Conclusions: In this population of inner-city pregnant and early post-partum women, we found that women with a history of adverse childhood experiences were at an increased risk for depression during pregnancy and postpartum. This study also demonstrates a positive correlation between adverse childhood experiences, attachment style, and perinatal depression. These findings suggest that we may be able to identify key risk factors for depression which could be employed early in pregnancy or even preconception.

Congenital Insensitivity to Pain and Anhydrosis in Pregnancy: Defying the Odds

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Case: Patient is a 26-year-old G2P1001 woman diagnosed at 2 months of age with chronic insensitivity to pain (CIPA). She presented to high-risk clinic at 26 weeks gestation. She has a history of undetected dental abscesses due to the absence of pain, resulting in extraction of all her teeth. She has a history of poor wound healing and osteomyelitis warranting bilateral above the knee amputations and a right arm amputation above the elbow. Prior obstetrical history includes a cesarean section at 38 weeks with delivery of a healthy male infant. A repeat cesarean section was planned for the current pregnancy. Anesthesia was consulted prior to delivery due to concern that the patient would not feel the sensations of labor and experience autonomic dysreflexia if proper anesthesia was not administered. At 37 weeks and 2 days, the patient presented for a cesarean section. She denied any contractions, vaginal bleeding, or leakage of fluid. She noted continued fetal movement and the non-stress test was reactive. Per ultrasound, the placenta was anterior, the amniotic fluid volumes were within normal limits, and fetal anatomy was normal. Patient underwent spinal anesthesia and cesarean section to deliver a female infant. Postpartum, her only complication was a chronic wound addressed by wound care.
Conclusions: CIPA is an autosomal recessive condition caused by mutations in the NTRK1 gene. When mutations arise, neuronal apoptosis of both sensory neurons and nerves in sweat glands occurs, causing the inability to feel pain or sweat. Given this, it is remarkable that the patient did not experience more complications with her pregnancies.
Clinical Significance: CIPA is an extremely rare disease with only 60 cases documented in the U.S. This may be the only reported case of a woman with CIPA of this phenotype having successful pregnancies.

Bibliometric, Authorship, and Collaboration Trends Over the Past 30 Years of Publication in the American Journal of Sports Medicine and Arthroscopy

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Purpose: To study bibliometric trends for the American Journal of Sports Medicine (AJSM) and Arthroscopy.
Methods: A bibliometric analysis over the past 30 years of AJSM and Arthroscopy was performed for published manuscripts using one representative year of each decade. Statistical analyses were performed with non-parametric methods for continuous variables and Fishers, Pearson's chi², and Cochran linear trend tests for categorical variables. P < 0.05 was considered statistically significant.
Results: There were 814 manuscripts from AJSM and 650 from Arthroscopy. For AJSM the number of manuscripts steadily increased from 86 in 1986 to 350 in 2016; for Arthroscopy the number of manuscripts increased from 73 in 1985/1986, to 267 in 2006, but then dropped to 229 in 2016. There were significant increases over time in all bibliometric variables for both journals, except for the number of citations, which had a slight decrease in 2016. Arthroscopy had a greater percentage of manuscripts from Asia compared to AJSM (19.3% vs 11.5%) while AJSM had a greater percentage from North America (70.3% vs 59.2%); both journals had similar percentages from Europe (18.2% for AJSM and 21.6% for Arthroscopy) (P = .00002). For AJSM the percentage of female first authors was 13.3% and increased 4.1 times from 4.7% 1986 to 19.3% in 2016 (P = .021); the percentage of female corresponding authors was 7.3%. For Arthroscopy, the percentage of female first authors was 8.1% and increased 5.6 times from 2.8% in 1985/1986 to 15.7% in 2016 (P = 0.00007); the percentage of female corresponding authors was 6.5%.
Conclusion: With the rising demands of publishing in academic medicine, understanding changes in publishing characteristics over time and by region is critical. AJSM and Arthroscopy showed an increase in most variables analyzed. Although Arthroscopy is climbing at a higher rate than AJSM for female authors, AJSM has an overall greater percentage of female authors.

Audiologic Improvement Following Middle Cranial Fossa Approach for Management of Spontaneous Cerebrospinal Fluid Leaks

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Purpose: To determine the audiologic improvement after middle cranial fossa (MCF) approach to repair spontaneous cerebrospinal fluid (sCSF) leaks.
Methods: Twenty-four consecutive patients (27 ears) with temporal bone sCSF leak over a 4- year period underwent MCF repair of temporal bone sCSF leak with audiometric testing including preoperative and postoperative pure tone average (PTA), air bone gap (ABG), and word recognition score (WRS) in the sCSF leak ear. Patient characteristics (age, gender, ethnicity, BMI), location of CSF leak, and presence of encephalocele(s) were recorded.
Results: Out of 27 ears, 55% had multiple tegmen defects and 82% had ≥1 encephaloceles. There were no recurrent CSF leaks at a mean [SD] follow up of 8.6 [10.3] months. The mean [SD] pre-operative PTA and ABG were 40.58 [15.67] dB and 16.44 [6.93] dB, respectively. There was significant improvement in mean PTA (9.38 [9.92] dB; p < 0.001; Cohen d=0.95) and ABG (8.22 [9.29] dB; P<0.001; Cohen d=0.88) after sCSF repair. Mean WRS improved (by 2.92 [6.33] %; p=0.024; Cohen d=0.46) from a mean pre-operative WRS of 93.16 [9.34] % to a mean post-operative WRS of 96.11 [7.00]%.
Conclusions: MCF approach for repair of sCSF leaks yields significant improvement in conductive hearing loss and is highly effective in management of the entire lateral skull base where multiple bony defects are often identified.

The Role of Social Determinants of Health in Prenatal Counseling

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Purpose: Most research to date focuses on the medical implications of prenatal testing. Regarding young pregnant moms, little research has been done on the social determinants of health that influence decision making after prenatal testing. Furthermore, limited literature exists on how education, socioeconomic status, and family support impacts the decision making ability of mothers.
Methods: We present a case of a 5-month old girl prenatally diagnosed with mosaic trisomy 9 complicated by congenital diaphragmatic hernia born to a 20 year-old G3 P2111 at 36+5 weeks via cesarean section. This was a high risk pregnancy due the prenatal diagnosis as well as a complex social history in mom which included a history of substance abuse, poor social support, and seeking care from multiple providers.
Results: Physician advocacy bridges clinical care with the identification of individual social determinants of health and or psychosocial stressors to ensure patients are provided with the best health and care.
Conclusions: This case highlights the challenges with predicting outcomes for patients with complicated diagnosis like trisomy 9 wherein the provision of effective prenatal counseling. Effective prenatal counseling including identification of the individual psychosocial stressors, and social determinants of health that impact patients is vital to ensuring that families make informed decisions. One that is fostered by adequate counseling about outcomes and implications postnatally, encouragement to seek multiple opinions and guidance through maintaining clear concise communication and continuity of care.

High Intensity Focused Ultrasound for Localized Prostate Cancer Treatment

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Purpose: To investigate the efficacy and side effect profile of High Intensity Focused Ultrasound (HIFU) on localized prostate cancer.
Methods: Between May 2016 and October 2018, 22 patients had HIFU as primary treatment for localized prostate cancer. The most common approach was hemi-ablation in 12 (54.5%) patients, hemi-ablation with "hockey stick" in 6 (27.3%), focal unilateral in 3 (13.6%), and focal bilateral in 1 (4.5%). Our follow-up includes Prostate Specific Antigen (PSA), complications, and quality of life assessments at 1, 3, 6, and 12 months. A confirmatory MRI-fusion biopsy was performed around 6 months post-HIFU in all patients.
Results: Pre-treatment biopsies of the 22 patients were graded using the Gleason Score (GS). These biopsies demonstrated that 9 (40.9%) patients were GS 3+4, 6 (27.3%) patients were GS 4+3, 2 (9.1%) patients were GS 4+4, and 1 (4.5%) patient was GS 3+3. In the 18 patients that received a 6-month confirmatory biopsy, tumor persistence was demonstrated on the treatment side in 4 (22.2%) patients (all Gleason 3+3). This also showed contralateral tumor presence in 3 (16.7%) patients of Gleason 3+4 and 3 (16.7%) patients with Gleason 3+3 that were newly diagnosed. Of the 18 patients, the median PSA was 5.68 at baseline and 2.2 by 6 months, showing a 61.3% fall. The most common side effects were hematuria, urinary obstructive symptoms and incontinence. Respectively, these occurred in 9 (56.3%), 3 (18.8%), and 1 (6.2%) patients at their 1-month follow up (16 total), and occurred in 0, 0, and 1(5.6%) of patients at 6 months (18 total). Only 1 (6.2%) of 16 patients experienced worsened erectile function at their 1-month follow up, while 1 (5.6%) of 18 patients noted this at their 6-months. There were no intraoperative complications.
Conclusions: In our cohort, HIFU showed few short-term side effects and no clinically significant infield recurrences.

Iatrogenic Peroneal Nerve Palsy Rates Secondary to Open Reduction Internal Fixation for Tibial Plateau Fracture

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Purpose: The purpose of this analysis is to report the rate of peroneal nerve palsy secondary to intraoperative skeletal traction during open reduction internal fixation (ORIF) for lateral unicondylar and bicondylar tibial plateau fracture (TPF) repair and associated epidemiology.
Methods: One hundred twenty-four patients that underwent ORIF for TPF were identified, of which 10 were excluded as medial unicondylar tibial plateau fractures. Of the remaining 114 patients, complete medical records were available for 64 patients due to loss of previous EMR data. An additional 4 patients were excluded due to development of compartment syndrome, leaving a total of 60 patients for this review. Of these 60 patients, 21 lateral unicondylar and 40 bicondylar TPFs underwent surgical repair via ORIF. All cases utilized a distractor to provide intraoperative traction, pneumatic tourniquet, and peripheral nerve blockade.
Results: There were a total of 21 lateral unicondylar and 40 bicondylar TPFs repaired via ORIF in 60 patients identified during the study period. The incidence of iatrogenic peroneal nerve palsy secondary to intraoperative skeletal traction was 16.4% (10 of 61). Only 60% (6 of 10) of peroneal nerve palsies recovered clinically with a mean recovery time of approximately 14 weeks. Comparison of demographics in patients with peroneal nerve palsy versus those without yielded no significant difference in patient sex ($p = 0.08$), age ($p = 0.27$), fracture type ($p = 0.29$), tobacco use ($p = 0.44$) or alcohol use ($p = 0.78$).
Conclusion: Peroneal nerve palsy is a common sequela of ORIF for TPFs involving the lateral compartment, constituting 16.4% of cases. Many patients (40%) who develop peroneal nerve palsies do not recover, leading to permanent loss of motor and/or sensory function for 6.6% of patients studied. None of the epidemiologic variables evaluated yielded predictive value for development of peroneal nerve palsy or subsequent resolution.

Role of Covalent Modification of Hyaluronan with Inter-Alpha Inhibitor Heavy Chains During Acute Lung Injury

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Purpose: The presence of heavy chain (HC)-modified hyaluronic acid (HA) in the extracellular matrix is a feature of several inflammatory lung diseases, but its role in the onset and resolution of inflammation is incompletely understood. Recent reports indicate that covalent modification of HA with the HCs of serum protein inter-alpha-inhibitor (IαI) is critical to neutrophil sequestration in liver sinusoids and to animal survival during experimental lipopolysaccharide (LPS)-induced sepsis. Using mice deficient for tumor necrosis factor α (TNFα)-stimulated-gene-6 (TSG-6), the exclusive mediator of HC-HA formation, we investigated its role in the initiation and resolution of lung inflammation in models of acute lung injury (ALI) induced by respiratory infection.
Methods: Mice received a single intratracheal instillation of LPS or Pseudomonas aeruginosa. Lungs and bronchoalveolar lavage fluid were studied for up to six days post-instillation. HC-HA formation was determined via hyaluronidase digestion and HA fragments were detected by gel electrophoresis. Lung inflammation was assessed by flow cytometry, as well as albumin and RAGE levels in the bronchoalveolar fluid. TSG-6 secretion by TNFα- or LPS-stimulated human alveolar macrophages, lung fibroblast Wi38, and bronchial epithelial BEAS-2B cells was assessed by ELISA.
Results: Extensive HC-modification of lung HA, with predominant peri-broncho-vascular localization was notable during early inflammation and markedly decreased during its resolution. Whereas human alveolar macrophages secreted functional TSG6 following both TNFα and LPS stimulation, fibroblasts and bronchial epithelial cells responded to only TNFα. Compared to wild type, TSG-6-null mice, which lacked HC-modified HA, exhibited moderately greater lung injury.
Conclusions: Respiratory infections induce rapid HC modification of HA followed by fragmentation and clearance, with kinetics that parallel the onset and resolution phase of ALI, respectively. Further studies are needed to understand how HCHA can critically promote survival during systemic LPS-induced vascular shock while only conferring modest protection against localized intratracheal LPS exposure.

Atypical Presentation of Herpes Simplex Virus Esophagitis in an Immunocompetent Patient

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Introduction: Herpes Simplex Virus esophagitis (HSVE) is a well-documented opportunistic infection affecting immunocompromised patients. It can rarely manifest in the immunocompetent patient, with the most recent review in 2010 demonstrating 56 documented cases. Such patients commonly present with acute odynophagia, fever, and retrosternal pain. Here, we report a case of HSVE affecting an immunocompetent patient with a more subacute presentation.
Methods: A 37-year-old Nigerian female presented with generalized weakness, weight loss, and new onset dysphagia of two months duration. The dysphagia had progressed from solids to liquids with intermittent odynophagia. She denied fevers, chills, hematemesis, and melena. On exam, she was afebrile and exhibited no oropharyngeal lesions. Her abdomen was nontender to palpation and she demonstrated no hepatosplenomegaly or palpable masses. Labs showed severe iron deficiency anemia requiring transfusion, a normal white cell count, and a negative HIV screening test. An upper endoscopy (EGD) showed multiple small non-bleeding erosions throughout the middle and distal esophagus. Esophageal biopsy demonstrated squamous epithelium with viral inclusions and multinucleated cells. Immunohistochemical stain was focally positive for HSV supporting the diagnosis of herpes esophagitis. She was subsequently started on 7-day treatment of oral acyclovir 400 mg three times a day and had resolving symptoms one week later at her primary care visit.
Discussion: This case illustrates the importance of considering a diagnosis of HSVE in immunocompetent individuals, who present with a subacute course of worsening dysphagia without systemic symptoms. Moreover, as HSVE endoscopic lesions can vary in appearance and location, gastroenterologists should have a low threshold for biopsying atypical lesions in the immunocompetent. In a recent study comparing endoscopic features of HSVE in immunocompromised and immunocompetent patients, endoscopists were more likely to mention the possibility of viral esophagitis on the endoscopy report in patients that were immunocompromised. Although HSVE in the immunocompetent is typically a self -limited disease, treatment with oral acyclovir can result in resolution of symptoms within 1-2 weeks. The etiology of HSVE in the immunocompetent may represent a primary infection of traumatized esophageal mucosa or reactivation after a previous infection.