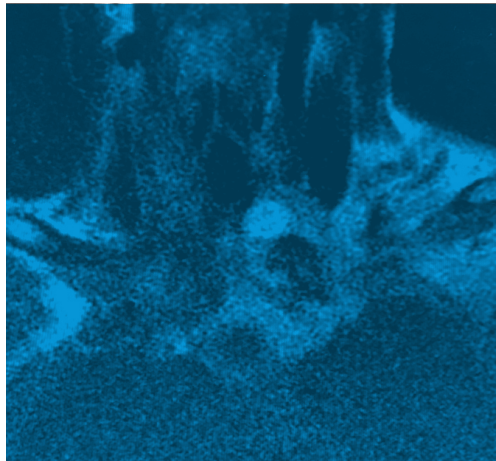
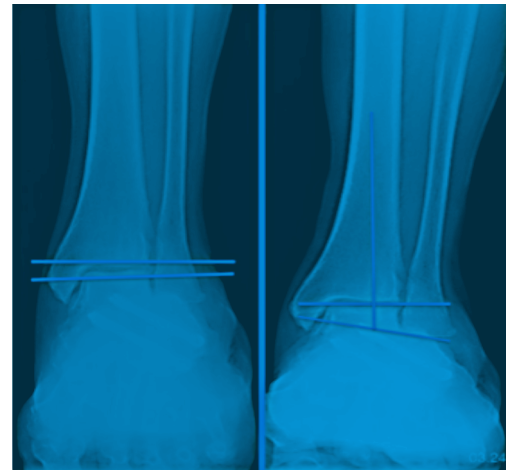
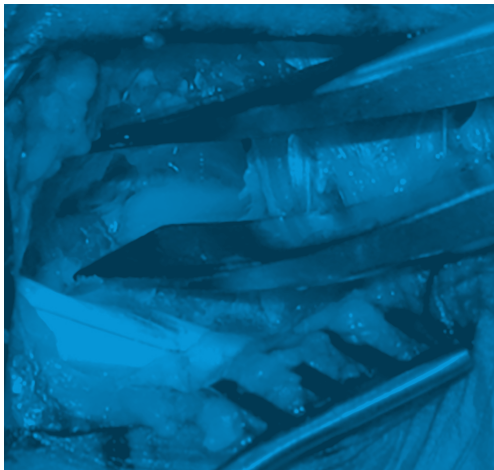




ST. VINCENT CHARITY
MEDICAL CENTER

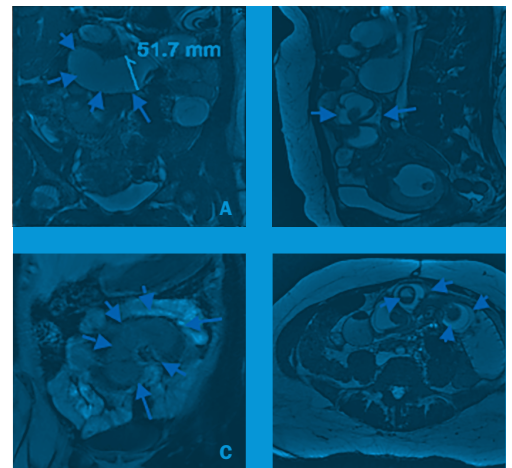
JOURNAL

VOL. 7 ISSUE 1 | SUMMER 2018



IN THIS ISSUE

- A Near Fatal Case of Intussusception and Ischemic Perforation of Stomach in First-Trimester Pregnancy: Eight Years after Laparoscopic Roux-en-Y gastric Bypass.... p.3
- Pain in the Neck: A Case of Strap Muscle Pyomyositis in a Patient with Selective IgM Deficiency p.5
- Connecting the Dots – Acute Abdomen, ST Elevation and a Consolidating Lung Mass p.6
- Apexification, Apexogenesis and Pulpal Revascularization: Literature Review and Clinical Applications p.7
- Incidence of Ankle Valgus Following Isolated STJ Arthrodesis: A Short-Term Study p.9
- Is Cognitive Impairment Related to Peripheral Neuropathy?..... p.14



ST. VINCENT CHARITY MEDICAL CENTER JOURNAL

Vol. 7 Issue 1 | Summer 2018

EDITORIAL TEAM

EDITOR IN CHIEF

Keyvan Ravakhah, MD, MBA, FACP

CHIEF RESIDENT EDITOR

Percy Adonteng-Boateng, MD, MPH

ASSISTANT EDITOR

Hunter Mwansa, MD

ISSUE CONTRIBUTORS

Keyvan Ravakhah, MD, MBA, FACP

Program Director, Department of Internal Medicine,
St. Vincent Charity Medical Center

Michael Canales, DPM

Program Director of Podiatry Medicine and Surgery Residency,
St. Vincent Charity Internal Medicine Residency

Michael M. Nowak, MD

Center for Bariatric Surgery, St. Vincent Charity Medical Center

Mukul Pandit, MD

Department of Internal Medicine and General Surgery,
St. Vincent Charity Medical Center

Kamran Adibi, MD

Internal Medicine Resident, St. Vincent Charity Medical Center

Percy Adonteng-Boateng, MD, MPH

Internal Medicine Resident, St. Vincent Charity Medical Center

Rajarshi Bhadra, MD

Internal Medicine Resident, St. Vincent Charity Medical Center

Grace C. Craig, DPM

Podiatry Resident, St. Vincent Charity Medical Center

Alex Dawoodian, DPM

Podiatry Resident, St. Vincent Charity Medical Center

Nafisa Elmi, DDS

Dentistry Resident, St. Vincent Charity Medical Center

Randol Kennedy, MD

Internal Medicine Resident, St. Vincent Charity Medical Center

Gurneet Khangura, DPM

Podiatry Resident, St. Vincent Charity Medical Center

James Tamesis, MD

Internal Medicine Resident, St. Vincent Charity Medical Center

Hunter Mwansa, MD

Internal Medicine Resident, St. Vincent Charity Medical Center

Andleeb Qureshi, DMD

Dentistry Resident, St. Vincent Charity Medical Center

JOURNAL ARTICLES AND AUTHORS

A Near Fatal Case of Intussusception and Ischemic Perforation of Stomach in First-Trimester Pregnancy: Eight Years after Laparoscopic Roux-en-Y gastric Bypass – p. 3

**Rajarshi Bhadra, MD; Kamran Adibi, MD;
Keyvan Ravakhah, MD; Michael M. Nowak, MD**

Pain in the Neck: A Case of Strap Muscle Pyomyositis in a Patient with Selective IgM Deficiency – p. 5

**James Tamesis, MD; Hunter Mwansa, MD;
Mukul Pandit, MD; Keyvan Ravakhah, MD, MBA**

Connecting the Dots—Acute Abdomen, ST Elevation and a Consolidating Lung Mass – p. 6

**Randol Kennedy, MD;
Percy Adonteng-Boateng, MD, MPH**

Apexification, Apexogenesis and Pulpal Revascularization: Literature Review and Clinical Applications – p. 7

Nafisa Elmi, DDS; Andleeb Qureshi, DMD

Incidence of Ankle Valgus Following Isolated STJ Arthrodesis: A Short-Term Study – p. 9

**Gurneet Khangura, DPM; Grace C. Craig, DPM;
Michael Canales, DPM**

Is Cognitive Impairment Related to Peripheral Neuropathy? – p. 14

**Alex Dawoodian, DPM; Grace C. Craig, DPM;
Michael B. Canales, DPM**



ST. VINCENT CHARITY MEDICAL CENTER

The St. Vincent Charity Medical Center family is committed to the healing mission of Jesus. We serve with: a deep respect for the dignity and value of all persons; our practice of quality care; our dedication to the poor; and, our commitment to education. St. Vincent Charity Medical Center, with the commitment of its caregivers and physicians, will be a leading model for health care delivery in Northeast Ohio based on its faith-based mission, dedication to education, commitment to the communities it serves, excellence in the patient experience it provides, focus on surgical services, and partnerships with physicians and other constituencies.

St. Vincent Charity Medical Center

2351 East 22nd Street | Cleveland, Ohio 44115

216-861-6200 | www.stvincentcharity.com

*We want to hear from you. Send your feedback
to researchjournal@stvincentcharity.com*

Clinical guidelines and protocols have become staples in clinical practice. Guidelines and protocols are often a set of recommendations including algorithms, lab tests and therapeutics put together by experts to steer clinicians toward best medical practices. These guidelines and protocols have the potential to ensure consistency in care delivered and improved quality of clinical decision [1]. In many instances guidelines and protocols have become the standard of care. From the stand point of medical and clinical education however, guidelines and protocols may impact negatively on the quality of physicians we churn out of our residency programs.

Residents who are trained to reference these guidelines and protocols in every clinical situation may fail to develop their own clinical reasoning skills and confidence. Furthermore, they might not recognize the nuances and how the same set of patient symptoms can point to different disease conditions. This inevitably leads to overtreatment and unnecessary services. For instance, if a patient comes to the emergency department with chest pain and all the physician does is to activate a chest pain protocol, follow the steps and order various tests, investigation and consult services the protocol suggests, then the physician may hardly develop any clinical acumen and independence. The doctor in this scenario has outsourced his or her critical thinking and reasoning to the experts who make the protocols and guidelines.

One way to help trainee doctors to develop clinical skills and critical thinking is exposure to both the typical and atypical ways that diseases present. In this edition of the Journal, Kennedy et al report a case of community acquired pneumonia that presented with acute abdomen. The pneumonia was picked up incidentally from an abdominal CT scan. A history of productive cough and fever, which could have pointed to an early diagnosis of pneumonia, was rather elicited after an elaborate investigation had been done for the acute abdomen.

Inadequate supervision of residents to guide them through clinical decision making may leave them little option but to heavily rely on guidelines and protocols. Add the fear of litigation and low-quality practice for not following the “standard of care” and protocols become a no-brainer. What is a better excuse than saying that you just followed the protocol? Indeed, residents and trainee clinicians have been known to order tests liberally and spend more on health care than do other physicians [2].

We wish to encourage clinical educators and attending physicians to be invested in the training of resident physicians. The medical community and rest of society stand to benefit immensely if we have well trained clinicians.

References

1. Woolf SH, Grol R, Hutchinson A, Eccles M, Grimshaw J. Potential benefits, limitations, and harms of clinical guidelines. *BMJ : British Medical Journal*. 1999;318(7182):527-530.
2. Dine CJ, Miller J, Fuld A, Bellini LM, Iwashyna TJ. Educating physicians-in-training about resource utilization and their own outcomes of care in the inpatient setting. *J Grad Med Educ*. 2010; 2:175-80.



A Near Fatal Case of Intussusception and Ischemic Perforation of Stomach in First-Trimester Pregnancy: Eight Years after Laparoscopic Roux-en-Y gastric Bypass

By **Rajarshi Bhadra, MD; Kamran Adibi, MD; Keyvan Ravakhah, MD; Michael M. Nowak, MD**

CLINICAL CASE

40-year-old female in first trimester of pregnancy came to the hospital complaining of worsening abdominal pain, 10/10 in intensity and tearing in character. The pain was more localized in her epigastric and peri-umbilical region and was associated with nausea and vomiting frank blood. Her symptoms started in the morning of the same day she presented with feeling nauseous and vomiting non-bloody gastric content. She developed crampy abdominal pain that progressively worsened throughout the day, and started vomiting blood actively in the evening. Her significant medical history included Rh incompatibility and bariatric surgery in 2009 (laparoscopic gastric bypass with Roux-en-Y anastomosis).

Nasogastric tube was placed, and ultrasound of abdomen done in the local hospital showed 9.6 cm lobulated mostly solid mass versus an abnormal segment of bowel located in the left lower quadrant. Abdominal MRI done at the same hospital showed intussusception of small bowel involving the jejunum with obstruction and dilated small bowel loops up to 5 cm diameter along the duodenal sweep and proximal jejunum. (Figure 1) There was marked abdominal distension, with guarding and rebound tenderness and hypoactive bowel sounds. Lab results were remarkable for neutrophilic leukocytosis and a hemoglobin of 12.7g/dL. Intravenous fluids were administered and 2 units of PRBCs were kept on hold. The patient's abdominal pain was severe and

| continued on p.4



A Near Fatal Case of Intussusception and Ischemic Perforation of Stomach in First-Trimester Pregnancy: Eight Years after Laparoscopic Roux-en-Y gastric Bypass

(cont. from previous page)

uncontrolled even by maximum permissible doses of hydromorphone.

Intravenous pantoprazole and Ondansetron was started. Immediate exploratory laparotomy was performed. Upon entering the abdomen, there was a gush of bilious fluid. About 2 liters of bilious fluid was suctioned. There was jejuno-jejunal intussusception with extensive ischemic necrosis of the small bowel and the jejunostomy site. The proximal biliopancreatic limb was markedly distended. There were ischemic perforation and necrosis of the fundus of the stomach, which was partially resected with findings of acute focal inflammation with transmural necrosis. The jejuno-jejunal intussusception was resected. The Roux limb along with the gastric pouch was viable and intact. The bilio-pancreatic limb was viable and intact. Proximal fundus of the stomach was ischemic. It was dissected. Re-anastomosis was done to maintain GI continuity and thorough irrigation of the peritoneal cavity was performed. Post surgery, the patient got transferred to the surgical intensive care unit on mechanical ventilation, started on meropenem, and once she became stable, she was extubated. She was then transferred to a center with high risk neonatal unit for management of her overall condition including her pregnancy. She made complete recovery with an intact, viable fetus.

CONCLUSION

Most cases of intussusception in medical literature occur between one and three years post-operative [2]. About 20 articles have reported postoperative intussusception in Roux-en-Y gastric bypass (RYGB) [3]. There is one case report of intussusception after seven years post bariatric surgery [4]. In the present scenario where obesity is an epidemic, bariatric surgery is fast becoming a viable option for many. Therefore, the occurrences of intussusception are bound to increase. The etiology of post-bariatric intussusception, however, is largely unknown. An iatrogenic lead point created by the suture or staple line at the entero-enteral anastomosis may create hyperperistalsis of the excluded segment causing the biliopancreatic limb to telescope into the common limb [5-8]. While reduction alone of the intussusception is safe and effective, there is a risk of recurrence, and imbrication of the J-J anastomosis may be a more effective means of treatment. At least half of the patients undergoing weight loss surgery are women of childbearing age [9]. Diagnosis necessitates a high index of clinical suspicion and appropriate imaging studies. There should be a very low threshold for surgical exploration even if the diagnosis is equivocal.

References

1. Wax JR, Wolff R, Cobean R, et al. Intussusception complicating pregnancy following laparoscopic roux-en-y gastric bypass. *Obes Surg.* 2007;17:977-979.
2. Al-Sabah S, Christou N. Intussusception after laparoscopic Roux-en-Y gastric bypass. *Surg Obes Relat Dis.* 2008;4:205-9.
3. Santry HP, Gillen DL, Lauderdale DS. Trends in bariatric surgical procedures. *JAMA.* 2005;294:1909-17.
4. Boudourakis, Leon D., Celia Divino, and Scott Nguyen. "Retrograde intussusception seven years after a laparoscopic Roux-en-Y gastric bypass." *Journal of Minimal Access Surgery* 9.2 (2013): 82.
5. Al-Sabah S, Christou N. Intussusception after laparoscopic Roux-en-Y gastric bypass. *Surg Obes Relat Dis.* 2008;4:205-9. [PubMed]
6. Simper S, Erzinger J, McKinlay R, Smith S. Retrograde (reverse) jejunal intussusception might not be such a rare problem: A single group's experience of 23 cases. *Surg Obes Relat Dis.* 2008;4:77-83. [PubMed]
7. Nelson RL, Williams L, Bombeck T. A

unique late mechanical complication of jejunoileal bypass. *Dis Colon Rectum.* 1985;28:738-40. [PubMed]

8. Miller DR. Intussusception of the bypassed segment after jejunoileal bypass for obesity: A cryptic problem. *Am J Gastroenterol.* 1979;72:434-40.
9. Wax JR, Pinette MG, Cartin A, Blackstone J. Female reproductive issues following bariatric surgery. *Obstet Gynecol Surv.* 2007;62(9):595-604.

Figure 1

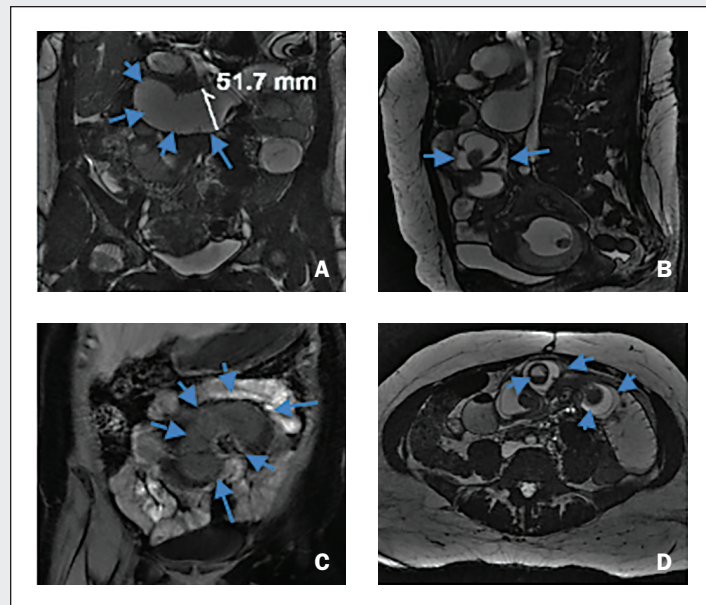


Fig 1. An MRI of abdomen of patient with intussusception. Telescopic sign is seen on the coronal views, A and C. Target sign is seen on both axial and sagittal views, D and B respectively.



Pain in the Neck: A Case of Strap Muscle Pyomyositis in a Patient with Selective IgM Deficiency

By **James Tamesis, MD; Hunter Mwansa, MD; Mukul Pandit, MD; Keyvan Ravakhah, MD MBA**

INTRODUCTION

Pyogenic myositis (pyomyositis) is a bacterial infection of skeletal muscle. It is commonly caused by *Staphylococcus aureus*. Previously regarded as a disease of tropical countries, pyogenic myositis has been reported in developed countries [1]. It remains uncommon, and cervical pyomyositis involving the muscles of the neck is even rarer. Delay in recognition and treatment of this condition can lead to devastating consequences including internal jugular vein thrombosis, sepsis, septic shock and death.

CLINICAL CASE

A 56-year-old female with no known past medical history came to the emergency department with complaints of left shoulder pain and chest pain of one day's duration. The chest pain was left sided, sharp, disabling and radiated to the neck. There was associated non-productive cough, fever and chills. The patient denied trauma, sore throat, odynophagia, dysphagia or gastrointestinal symptoms.

Physical exam was remarkable for a temperature of 37.5°C, mild respiratory distress, chest wall tenderness above the left breast and diminished breath sounds to both lung bases. Laboratory investigations showed elevated white cell count with bands of 23%, erythrocyte sedimentation rate of 98 and C-reactive protein of 52.7. Blood cultures were positive for *Streptococcus pneumoniae*. A thoracic CT scan obtained after an abnormal chest X-ray demonstrated

multilobar pneumonia. Ultrasound (Figure 1) of the left sternoclavicular joint and surrounding tissue revealed an enlarged, heterogeneous and hypervascular left strap muscle just cephalad to the joint space concerning for left strap muscle pyomyositis. MRI scan of neck was supportive of the ultrasound findings (Figure 2). Further work up revealed patient had selective IgM deficiency. Tests for other primary immunodeficiency syndromes, HIV and diabetes were negative.

Patient clinical condition improved with intravenous Ceftriaxone and Azithromycin. Her disabling chest and shoulder pain resolved, and her inflammatory markers (elevated white cell count and C-reactive protein) trended down. Patient was subsequently discharged with a 1-month course of oral Levofloxacin.

DISCUSSION

Pyomyositis, also known as myositis tropicans, is a bacterial infection of striated muscles. It was initially characterized as a disease of tropical and developing countries but cases in temperate regions have increasingly been reported [2]. Early diagnosis is often missed in developed countries because the disease is not frequently encountered and clinicians may be less familiar with the diverse ways it can present. Treatment requires antibiotic therapy directed at gram positive bacteria, mainly staphylococci and streptococci accompanied by incision and drainage in those with large purulent collections [3].

Figure 1

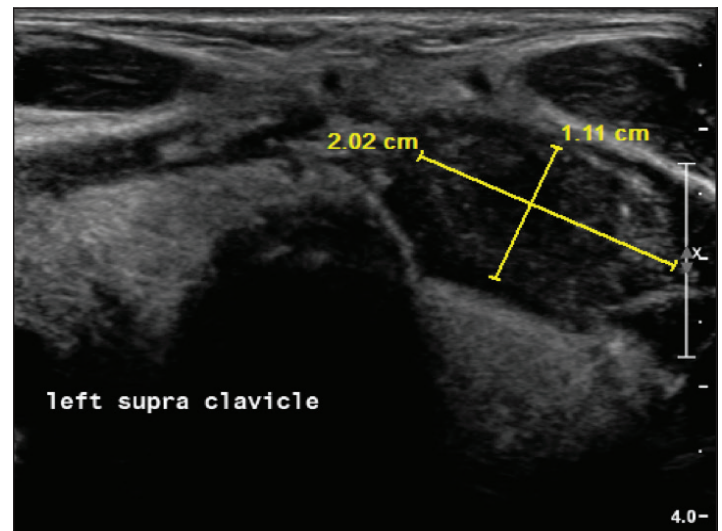


Fig 1. Ultrasound of the anterior chest wall showing a 2.02 cm x 1.11 cm enlarged, heterogeneous, hypervascular area cephalad to the left sternoclavicular joint, no definite fluid collection.

Figure 2



Fig 2. MRI T2 image of the anterior chest wall and neck showing a 2.17 mm x 10 mm possible fluid collection (arrow) in the supraclavicular region just superior to the sternal head.

| continued on p.19



Connecting the Dots—Acute Abdomen, ST Elevation and a Consolidating Lung Mass

By **Randol Kennedy, MD; Percy Adonteng-Boateng, MD, MPH**

INTRODUCTION

Community acquired pneumonia is a commonly treated disease and yet may present in very unfamiliar ways that if missed, may result in unnecessary testing, procedures and potential harm. Encouraging reporting and discussion of these atypical presentations may help increase clinical suspicion and timely diagnosis.

CLINICAL CASE

A 38-year-old male with no prior medical history came to the emergency department with a 3-day history of severe cramping lower abdominal pain. This was intermittent, non-radiating and was exacerbated with movement. Associating symptoms were anorexia, constipation, fever, chills, nausea and retching. He denied use of tobacco, alcohol or recreational drugs.

Physical exam revealed an acutely ill patient who was febrile (38.8C), with pulse 89 beats/min, respiratory rate 18 cycles/min, BP 164/85mmHg with orthostatic changes and oxygen saturation (room air) 98%. On abdominal exam, there was generalized abdominal tenderness with rigidity and guarding. Respiratory exam was normal. The patient was therefore worked up for an intra-abdominal cause of acute abdomen, which included acute appendicitis. Labs drawn showed white blood cell count 11300/ml without bands and hemoglobin 12.9 g/dl. CT scan of the abdomen revealed normal abdominal viscera and minimal abdominal free fluid. However,

a “mass like opacity” in the right lower lobe of the right lung was reported. Meanwhile, a 12-lead EKG showed left ventricular hypertrophy, ST elevation >2mm in V3-V4, T wave inversion in the inferolateral leads, and ST depression <1mm in leads II, III, and AVF (Figure 1). Cycled troponins were negative.

Review of systems by the admitting team highlighted a history of intermittent productive cough with yellow sputum one day prior to presentation. Dullness to percussion over right posterior lower lung fields was also noted on exam. A CT scan of the lung confirmed right lower lobe consolidation (Figure 2). Patient was therefore managed as a case of community acquired pneumonia with atypical presentation of acute abdomen. Blood cultures did not yield bacterial growth. Tests for legionella, mycoplasma, influenza A and B were all negative.

Patient treated empirically with ceftriaxone and azithromycin during his 5 days of hospital stay. He also received IV hydration to correct his orthostatic hypotension. Patient’s clinical condition improved during his stay. He resumed normal bowel habit on day 2 and his abdominal pain resolved completely by day 4 of hospital admission. Repeated EKGs were similar with some progression of ST elevation, cycled troponins were negative. A transthoracic echocardiogram revealed no ventricular wall motion abnormalities, ejection fraction was normal and there were no valvular abnormalities. Patient was discharged on a 1-week course

of cefpodoxime and given outpatient follow up.

DISCUSSION

Community acquired pneumonia typically presents with respiratory symptoms such as cough, sputum production, chest discomfort and shortness of breath. Non-specific symptoms like headache, fever, chills, malaise, loss of appetite and abdominal pain may also be present [1]. Symptoms like abdominal pain may overshadow the respiratory symptoms, especially when severe. In pediatric patients, pneumonia is the most common extra-abdominal cause of acute abdomen [2,3]. Acute abdomen, however, is rarely associated with pneumonia in adult patients and this may result in unnecessary delays in diagnosis and treatment [4]. Physicians must therefore consider extra-abdominal causes like pneumonia when evaluating acute abdomen. Clinical history, including a thorough review of system, is essential. It is also essential to consider chest X-ray, especially when the patient’s presentation is atypical.

Community acquired pneumonia may also present with abnormal EKG. Stein et al reviewed EKGs of 62 adult patients admitted with pneumonia and with no cardiac history, and showed that the most prevalent ECG abnormality, other than sinus tachycardia, was minor nonspecific ST-segment or T-wave changes. Their study also reported axis deviation and conduction abnormalities albeit transient [5]. Interpreting EKG with the appropriate

clinical context is therefore crucial. Our case had profound EKG changes suggestive of acute coronary syndrome (ACS), but his low pretext probability and normal troponin made myocardial infarction less likely.

Figure 1

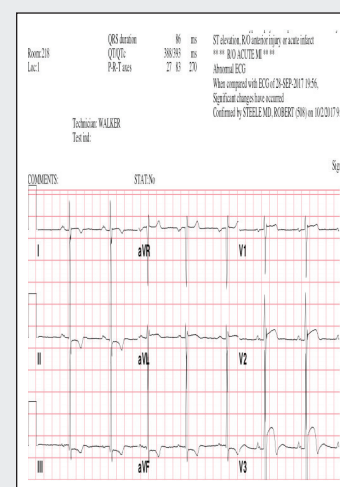


Fig 1. 12-lead EKG showing ST segment elevation >2mm in V3-V4, ST depression <1mm in leads II, III, AVF, and T wave inversion in inferior lateral leads.

Figure 2

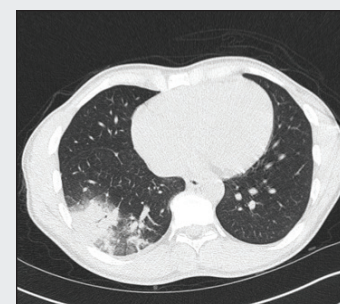


Fig 2. CT scan of the chest showing consolidation in lower lobe of right lung

| continued on p.19



Apexification, Apexogenesis and Pulpal Revascularization: Literature Review and Clinical Applications

By **Nafisa Elmi, DDS; Andleeb Qureshi, DMD**

INTRODUCTION

The immature permanent tooth with underdeveloped roots presents multiple challenges to successful endodontic treatment [1,3,6].

Due to canal size, it is difficult to adequately debride and disinfect with standard endodontic files [1,6]. An open apex does not provide an adequate barrier to root filling material, and thin dentinal walls are more susceptible to fracture [1]. Root canal treatment (RCT) with an incomplete and short root will also result in a less ideal crown to root ratio [12]. Various treatment options exist depending on root development and vitality of the tooth.

Apexification and apexogenesis have demonstrated high success rates [1,6]. Revascularization is a newer treatment that also shows high success. Apexification halts root development, but apexogenesis and revascularization result in continued root formation and apical closure [1,6,7]. (Figure 1)

APEXIFICATION

Apexification is the process of inducing apical closure in an immature tooth with necrotic pulp and an open apex to facilitate future obturation. Calcium hydroxide or mineral trioxide aggregate (MTA) are the materials of choice [1,6].

Shortcomings of treatment include high level of patient compliance as it takes multiple appointments over a long period of time. Calcium hydroxide has also been shown to decrease dentinal strength, increasing likelihood of

fracture. Contraindications include very short roots and vital pulp [1,2,7].

MATERIALS AND METHODS

1. Anesthetize tooth and isolate under rubber dam
2. Obtain straight line access to canal orifice
3. Chemo-mechanically debride canal with copious irrigation of 0.5% sodium hypochlorite and dried with paper points (cleaning and shaping with files is not recommended).
4. Obtain working length
5. Initial calcium hydroxide non setting medicament is evenly distributed in canal with interim seal 1 week, not to exceed 1 month [1]
6. A) MTA can be packed to fill the apical 3-4mm of root to create artificial apical closure. Wet cotton pellet placed on top of MTA stop for material to set. Recall patient 24 hours later. Canal space is filled with gutta percha or MTA [1]. Bonded resin can also be placed to the cemento-enamel junction to strengthen. 3, 6, 12 month recall.

B) Alternatively, initial dressing removed and replaced with CaOH paste in apical portion of canal and backfilled with CaOH paste. Temporized and patient is placed on 3-month recall.

7. Radiographically evaluated to see if CaOH has been washed out. If washed out, CaOH is replaced as before [1,6,7].

8. Final obturation with root filling material occurs once apical stop is detected clinically and radiographically and tooth is asymptomatic [1,6,7].

Figure 1

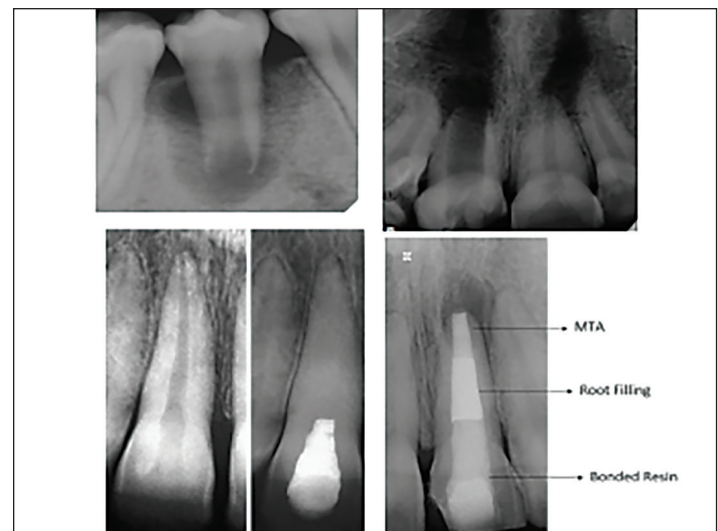
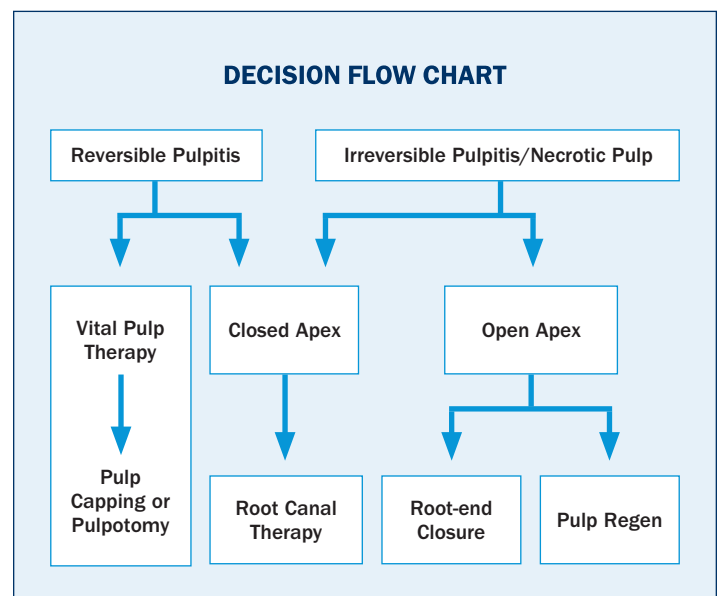


Fig 1. A and B show immature permanent teeth with large canal, open apex, underdeveloped roots and thin dentinal wall. C) Radiopaque canal filled with CaOH. D) Completed apexification with MTA aggregate [1,6]

Chart 1



| continued on p.8

APEXOGENESIS

Apexogenesis is a useful alternative to turn to for immature permanent teeth with vital pulp. Apexogenesis involves removing 2mm of infected pulp at the coronal part of the tooth, but leaving vital tissues in the root. It is also known as a Cvek pulpotomy. In 1978, Miomir Cvek published an article demonstrating the success of treating permanent teeth with pulp exposure using partial pulpotomy and calcium hydroxide. Today, this is a treatment of choice for minimally infected vital pulps, using MTA instead of calcium hydroxide [9,10].

Several factors indicate apexogenesis as the choice for treatment: carious pulp exposure with healthy vital pulp tissue (pink, not

spontaneously bleeding); no sensitivity to percussion; no mobility; no swelling or sinus tract; immature root(s) [11]. Contraindications include: inflamed, red, bleeding pulp; non-vital tooth; non-compliant patient.

However, apexogenesis is still an acceptable conservative choice when the indications are unclear, as the other treatments may still be performed if apexogenesis fails [12].

MATERIALS AND METHODS

1. Isolate the tooth using a rubber dam
2. Excavate carious dentin
3. Irrigate exposed pulp with saline
4. Remove 2mm of exposed pulp and surrounding dentin using a high-speed diamond bur + water
5. Irrigate gently with saline to achieve hemostasis
6. Place MTA or calcium hydroxide [13,14]
7. Restore cavity as desired [11]
8. Radiographic follow-up and pulp testing (percussion, palpation, mobility) will be necessary to confirm the success of the treatment.

Apexogenesis shows a high rate of success [11,15]. Success is measured by the absence of pathological findings on follow-up clinical exam, pulp testing and radiographs, and continued root formation in radiographs.

REVASCULARIZATION

Revascularization is a useful alternative for immature permanent teeth with nonvital pulp. Revascularization involves cleaning and disinfecting the tooth in a manner that allows cells to re-enter the tooth from the apex and induce dentin formation and root completion.

Several factors indicate revascularization as the choice for treatment: non-vital permanent tooth with immature apex; an open apex measur-

ing at least 1mm mesio-distally; a young patient 8-13 years old; and a short time period of the presence of infection. Similar to apexogenesis, revascularization is still a conservative choice when indications are unclear, as other treatments may still be performed if it fails [12].

MATERIALS AND METHODS

Treatment is done in 3 sessions. Chen et al provide a helpful chart in their review (Chart 2).

There are 2-3 weeks between the first and second session [16]. The preferred method of canal disinfection is to avoid using instruments and instead rely on irrigation only [16]. Instrumentation puts the apical stem cells at risk of obliteration. These stem cells are vital to the success of the treatment.

Triple antibiotic paste consists of minocycline, ciprofloxacin and metronidazole [16,17]. The recommended NaOCl concentration is between 0.5-5.25% [16].

CONCLUSION

Apexification, apexogenesis and pulpal revascularization are successful, evidence-based treatment options for immature teeth with underdeveloped roots. Pulpal vitality, pathology and symptoms are important considerations to determining appropriate course of treatment. Teeth treated with apexification have guarded prognosis and are prone to fracture. Recall appointments to monitor root development are essential to treatment success.

References

1. American Academy of Pediatric Dentistry. (2014). Guideline on Pulpal Therapy for Primary and Immature Permanent Teeth. *Clinical Practice Guidelines*, 37(6), 244-252.
2. Mélanie Namour and Stephanie Theys, "Pulp Revascularization of Immature Permanent Teeth: A Review of the Literature and a Proposal of a New Clinical Protocol," *The Scientific World Journal*, vol. 2014, Article ID 737503, 9 pages, 2014. doi:10.1155/2014/737503

3. Reddy, S., Sukumaran, V., & Bharadwaj, N. (2011). Tailor-made endodontic obturator for the management of Blunderbuss canal. *Journal of Conservative Dentistry*, JCD, 14(2), 199-202.
4. Simon, S., Rilliard, F., Berdal, A., & Machtou, P. (2007). The use of mineral trioxide aggregate in one-visit apexification treatment: a prospective study. *International Endodontic Journal*, 40(3), 186-197.
5. Shabahang, Shahrokh. "Treatment options: apexogenesis and apexification." *Journal of endodontics* 39.3 (2013): S26-S29.
6. Trope, M. (2010). Treatment of the immature tooth with a non-vital pulp and apical periodontitis. *Dental Clinics of North America*, 54(2), 313-324.
7. Wen, P. H., Liou, J. U., & Duh, B. R. (2009). Apexification of nonvital immature mandibular premolars using two different techniques. *Journal of dental sciences*, 4(2), 96-101. <http://doi.org/10.4103/0972-0707.82606>
8. Cvek, M. (1978). A clinical report on partial pulpotomy and capping with calcium hydroxide in permanent incisors with complicated crown fracture. *Journal of Endodontics*, 4(8), 232-237.
9. Karabucak, B., Li, D., Lim, J., & Iqbal, M. (2005). Vital pulp therapy with mineral trioxide aggregate. *Dental Traumatology*, 21(4), 240-243.
10. Fong, C. D., & Davis, M. J. (2002). Partial pulpotomy for immature permanent teeth, its present and future. *Pediatric dentistry*, 24(1), 29-32.
11. Neha K, Kansal R, Garg P, Joshi R, Garg D, Grover HS. Management of immature teeth by dentin-pulp regeneration: a recent approach. *Med Oral Patol Oral Cir Bucal* 2011;16:e997-1004
12. Barrieshi-Nusair, K. M., & Qudeimat, M. A. (2006). A prospective clinical study of mineral trioxide aggregate for partial pulpotomy in cariously exposed permanent teeth. *Journal of Endodontics*, 32(8), 731-735.
13. El Meligy, O. A., & Avery, D. R. (2006). Comparison of mineral trioxide aggregate and calcium hydroxide as pulpotomy agents in young permanent teeth (apexogenesis). *Pediatric Dentistry*, 28(5), 399-404.
14. Nosrat, A., Seifi, A., & Asgary, S. (2013). Pulpotomy in caries-exposed immature permanent molars using calcium-enriched mixture cement or mineral trioxide aggregate: a randomized clinical trial. *International journal of Paediatric Dentistry*, 23(1), 56-63.
15. Namour M, Theys S. Pulp revascularization of immature permanent teeth: a review of the literature and a proposal of a new clinical protocol. *Scientific-WorldJournal*. 2014;2014:737503.
16. Vijayaraghavan, R., Mathian, V. M., Sundaram, A. M., Karunakaran, R., & Vinodh, S. (2012). Triple antibiotic paste in root canal therapy. *Journal of Pharmacy & Bioallied Sciences*, 4(Suppl 2), S230.

Chart 2. CHX-chlorhexidine. MTA-mineral trioxide aggregate. TAP-triple antibiotic paste.

FIRST SESSION

- Access cavity preparation
- Irrigation (NaOCl, CHX, EDTA)
- Intracanal medication (Ca(OH)₂ paste or triple antibiotic paste)
- Temporary restoration

SECOND SESSION

- Removal of temporary restoration
- Irrigation (NaOCl, CHX, EDTA)
- Over-instrumentation (with K-file) to form blood clot
- Placement of MTA over blood clot
- Temporary restoration

THIRD SESSION

- Permanent restoration



Incidence of Ankle Valgus Following Isolated STJ Arthrodesis: A Short-Term Study

By **Gurmeet Khangura, DPM; Grace C. Craig, DPM; Michael Canales, DPM**

INTRODUCTION

Arthrodesis of the subtalar joint is a commonly used procedure for treatment of symptoms associated with moderate to severe arthritis and hindfoot malalignment, such as the adult acquired flatfoot. Triple, subtalar and talonavicular arthrodesis from a single medial incision, and isolated subtalar joint (STJ) arthrodesis have all been reported to decrease pain, improve function and restore hindfoot alignment [1,2,3]. A recent shift in thought has advocated for more joint sparing procedures, hence an increase in medial double and isolated STJ arthrodesis procedures.

Correction of hindfoot pathology has the potential to create or uncover a valgus deformity at the level of the ankle. Hyer et al proposed two mechanisms. The medial dissection, specific to the medial double arthrodesis technique, sacrifices the deltoid ligament in order to expose the joint surfaces [2]. Although components of the deltoid ligament are repaired, the deltoid ligament is weakened, which can lead to ankle valgus. Secondly, arthrodesis of the hindfoot prevents dissipation of valgus stress through mobile joints and instead increases stress on the medial soft tissue structures, including the deltoid ligament, and subsequently the development of ankle valgus [2].

With the increasing popularity of joint sparing techniques, the isolated STJ arthrodesis warrants further study. Isolated STJ arthrodesis is a reliable and reproducible

procedure with a mean time to fusion of 12.3 \pm 3.4 weeks [4]. The reported fusion rate is high, ranging from 84%-100%. There is no significant difference in union rates between single and double screw fixation [5].

To date, there have been no studies quantifying the incidence of ankle valgus deformity occurrence following isolated STJ arthrodesis. The present study was undertaken to radiographically assess the incidence of ankle valgus following isolated STJ arthrodesis. It is the authors' hypothesis that there would be a low incidence of ankle valgus following isolated STJ fusion. The patients included in this review were treated by one surgeon at one institution with the use of a single surgical approach with similar hardware constructs. The last author followed all the patients postoperatively.

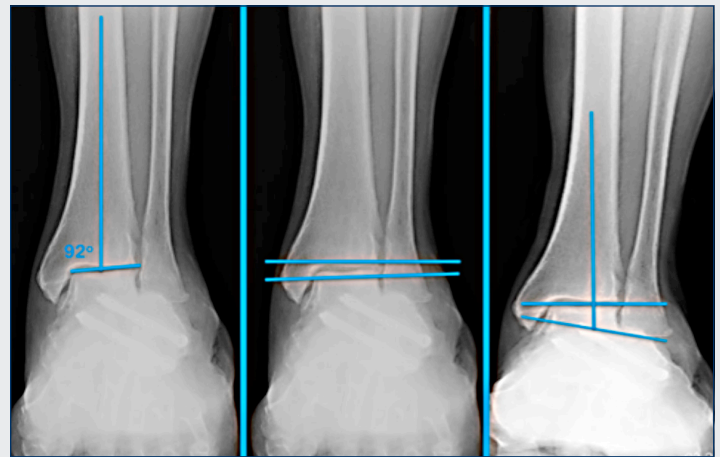
PATIENTS AND METHODS

A radiographic retrospective review of patients who underwent isolated subtalar joint arthrodesis from 2009 to 2016, performed by a single surgeon at one institution, with a minimum of six months of follow up was performed. The institutional review board approved this radiographic and chart review. Subjects were identified using the procedural code 28725 for subtalar joint arthrodesis.

POSTOPERATIVE RADIOGRAPHIC REVIEW

Preoperative and postoperative weight-bearing radiographs were

Figures 1-3



Figures 4-5



| continued on p.10

Incidence of Ankle Valgus Following Isolated STJ Arthrodesis: A Short-Term Study

(cont. from previous page)

Figures 6-7



reviewed. These included anteroposterior ankle views. The radiographic parameters used to assess ankle joint position included measurement of the tibiotalar angle and talocrural angle. The tibiotalar angle was determined by measuring the intersecting angle of the longitudinal axis of the tibia and the axis of the tibial plafond. The angle was then measured on the medial side and angles above 90 degrees were considered indicative of a valgus ankle [6] (Figure 1). In addition, Shenton's lines were drawn to assess the parallel nature of the articulating cartilaginous surfaces of the talus and the tibia (Figure 3). Talocrural angle was also evaluated (Figure 3). A single physician reviewed all radiographs. The ankle joint position was recorded.

OPERATIVE TECHNIQUE

The patient is placed on the operating table in the supine position with a bump (5 lb. sandbag and towel roll secured with tape) under the ipsilateral hip to allow access to the lateral aspect of the

operative foot. Equinus contracture is initially addressed through either gastrocnemius recession or percutaneous tendo Achilles lengthening depending on the etiology of equinus deformity. A lateral incision is made overlying the sinus tarsi and after evacuation of the tonsil of Hoke reciprocal joint surfaces are exposed employing a lamina spreader. A mixture of hand and power instrumentation is used for joint surface preparation, specifically hand curettage followed by subchondral penetration with a small (1.5 or 2.0) drill bit. Layered closure was performed per the senior author's preference.

Joint preparation preserves the overall contours of the calcaneus and talus intact so that the adjacent surfaces of the posterior facet maintain contact during manipulation into ideal position [7]. The STJ is manipulated through its entire range of motion while the sinus tarsi is observed. During maximal pronation the sinus tarsi is obliterated by the lateral process of the talus being in close

Figure 8



approximation of the floor of the sinus tarsi [1]. During maximal supination the sinus tarsi appears as a large void caused by the lateral process of the talus rotating away from the floor of the sinus tarsi as the talus rides up on the posterior facet of the calcaneus [7]. Neutral calcaneal stance position is determined similar to the technique used when casting for orthotic devices [7]. The heel is cupped and neutral position is confirmed with calcaneal axial and lateral fluoroscopic views (Figure 4). Loading the lateral column of the foot with an army-navy retractor simulates weight bearing (Figure 5). The calcaneal axial view ensures that the long axis of the calcaneus is parallel with the mid diaphyseal line of the distal tibia [8].

With the aide of fluoroscopic guidance, two large (6.5, 6.7 or 8.0) cannulated screws are placed across the posterior facet of the STJ parallel to one another in a percutaneous fashion through the posterolateral tuber of the calcaneus into the talus. Ancillary incisions were closed with non-absorbable

suture and a short leg modified Jones compression cast in neutral position is applied. Serial casting was performed when necessary for a total of six weeks followed by protected weight bearing in pneumatic fracture walker for an additional three to four weeks, and then tubi-grip® or ted hose compression sleeves for edema management for up to one year postoperatively. Post-operative radiographs were taken at six weeks, three months, six months and one year.

RESULTS

A collective total of 51 patients were identified. Nineteen patients were excluded due to lack of post-operative ankle films. Thirty-two patients included in the study had a range of follow up from six months to eight years. All 32 patients had a minimum of six months follow up. There were 18 females and 14 males included in the study. The age range was from 16 years old to 74 years old and the mean age was 51 years old at the time of surgery. Post operatively, one patient developed ankle val-

Figure 9

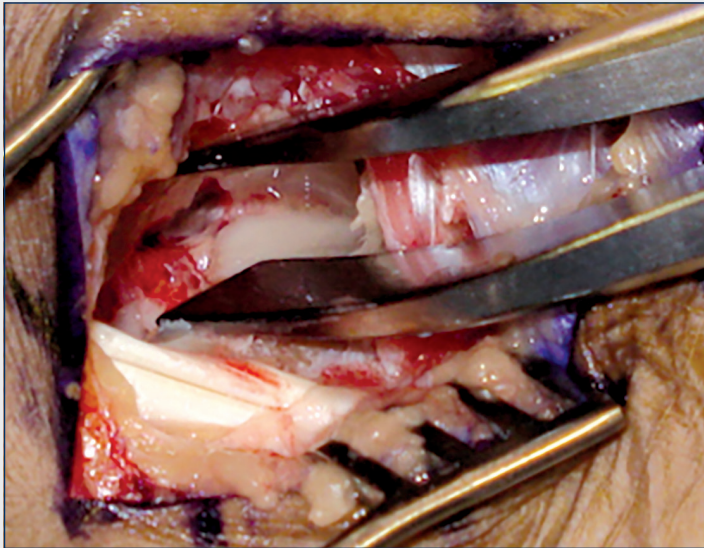
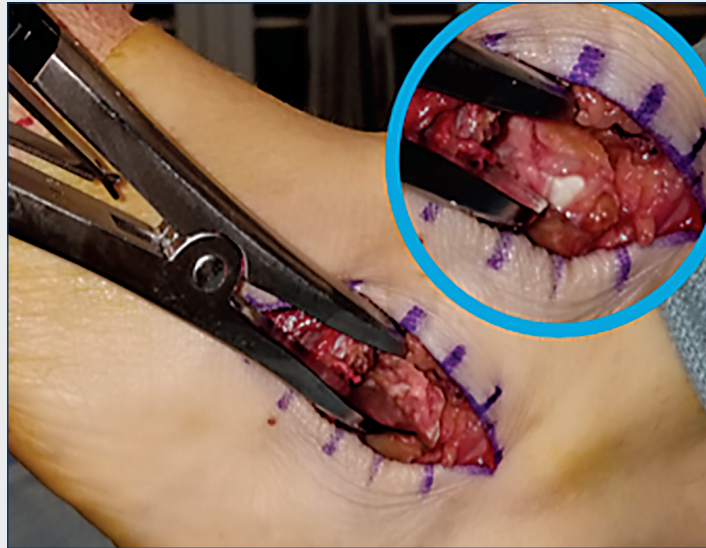


Figure 10



gus deformity at six months.

DISCUSSION

The isolated subtalar joint arthrodesis is a versatile procedure that predictably corrects the STJ into a neutral position [9]. This procedure can be used to treat a wide range of pathologies affecting the lower extremity, including post traumatic arthritis, talocalcaneal coalitions, STJ instability, adult acquired flatfoot secondary to posterior tibial tendon dysfunction, neurospastic diseases, inflammatory arthropathies, congenital deformities. Modifications, including interpositional graft and ancillary soft tissue procedures, can be used to correct the overall foot structure. Yu et al found that STJ arthrodesis is capable of multiplanar correction (Figures 6-7) specifically with improvements in talar declination angle, talocalcaneal angle, talo 1 metatarsal angle and talo navicular congruity [9].

Surgeons have moved toward joint sparing procedures to minimize arthritis to adjacent joints, retain hindfoot motion and avoid

the need for future revisional procedures should nonunion or malunion occur. Isolated STJ arthrodesis employs one incision that directly visualizes one joint for fusion (Figure 8). This approach reduces the risk of wound healing complications by having only one incision. Also, there are fewer sites of potential malunion or nonunion.

Development of arthritic changes to proximal and distal joints is minimized when the STJ fusion position is closest to neutral [9]. Sixty-six percent of triple arthrodesis failures can be attributed to malalignment of the hindfoot [10]. Graves et al found that in a case series of 17 patients, four patients developed ankle valgus and degenerative joint disease secondary to a severe valgus position of the heel following surgery [2]. Intraoperative protocols to evaluate hindfoot alignment must be employed to ensure fusion of the STJ in as close to neutral position as possible. As well, care should be taken during joint preparation to preserve as much of the natural architecture

and contours of the STJ as possible (Figures 9-10).

Matching the correct procedure to the appropriate patient is of utmost importance. Severe deformities involving ankle joint arthrosis would be better treated with ankle arthrodesis or tibiotalocalcaneal arthrodesis. Patients with more significant deformities or whose deformities are undercorrected are more likely to develop valgus tibiotalar tilt [11]. Weight bearing radiographs should be evaluated for signs of degenerative joint disease at the midtarsal and midfoot articulations [1]. As well, normal osseous architecture should be present even with joint malposition [1]. Postoperative complications could be partly attributed to poor procedure selection. In the present study, no patients displayed midtarsal arthritis, ankle degenerative arthritis or posterior tibial tendon rupture preoperatively. It is believed that the low incidence of ankle valgus following isolated STJ arthrodesis is attributed to appropriate patient-procedure selection.

Additionally, a potential explanation for the low incidence of ankle valgus following isolated STJ arthrodesis is the mobility of adjacent joints. The uncoupled TN and CC joints may be permitted to absorb and dissipate valgus hindfoot stresses. In the case of the triple arthrodesis, the fused hindfoot creates a rigid lever arm that places increased valgus stress on the medial ankle leading to failure of medial soft tissue structures including the deltoid ligament and ankle valgus deformity [2]. The rigid rearfoot complex produced secondary to triple and medial double arthrodesis, combined with deltoid ligament attenuation, leads to eccentric forces through the tibiotalar joint, producing a valgus tibiotalar tilt [11].

The role of the deltoid ligament in the development of hindfoot pathology has recently gained popular interest. Song et al believed that the progressive flatfoot deformity resulted in attenuation of the deltoid ligament. The incisional approach of the medial double arthrodesis transects portions of

| continued on p.12

Incidence of Ankle Valgus Following Isolated STJ Arthrodesis: A Short-Term Study

(cont. from previous page)

Figure 11



the deltoid ligament further compromising it. Surgically traumatizing an already compromised structure may contribute to the development of ankle valgus following medial double arthrodesis and triple arthrodesis to correct a flat-foot deformity. Resnick et al found the greatest stress was placed on the deltoid ligament when lateral displacement calcaneal osteotomies were performed [12]. This finding reinforces the fact that neutral position is essential to a successful arthrodesis procedure. Arthrodesis of the hindfoot in an improper position results in excess stress on a deltoid ligament that has already been weakened from posterior tibial tendon dysfunction (PTTD). Restoration of the hindfoot to a rectus position could relieve stress on the deltoid ligament and is associated with a low incidence of ankle valgus deformity.

Attenuation of the posterior tibial tendon, as seen in PTTD, can place the deltoid ligament under excessive pathologic stress. A healthy posterior tibial tendon has been found to protect the deltoid ligament from excess strain [12]. As damage to the posterior tibial tendon (PTT) increases so does the strain placed on the medial

ankle soft tissues. Eventually, the deltoid ligament is unable to compensate for the damaged PTT and is overcome by strain leading to external rotation of the talus resulting in valgus tibiotalar tilt. Age and obesity have been associated with worsening PTTD, so it can be inferred that with increasing age and BMI there is a greater risk for formation of valgus tibiotalar position.

Triple and double arthrodesis can be performed through both single medial and double medial and lateral incision approaches. There is no difference in occurrence of valgus tibiotalar tilt between the solely medial and dual incisional groups [11]. There is however a reduction in occurrence of valgus tibiotalar tilt when a lateral only incision is used, as in the case of isolated STJ arthrodesis [11]. The correlation between medial dissection and development of valgus ankle deformity can be attributed to iatrogenic compromise of the deltoid ligament. Exposure of the talonavicular joint surfaces requires the talonavicular portion of the deltoid ligament be reflected and puts the spring ligament at risk of iatrogenic compromise [11]. In addition, extension of the medial incision for exposure

of the STJ surfaces puts the tibiocalcaneal portion of the deltoid ligament at risk. The incision for the medial double arthrodesis is made just inferior to the medial malleolus, extending along the course of the posterior tibial tendon to the navicular tuberosity [2] (Figure 11). This incision is in close approximation to the origin and insertion of the deltoid ligament. The tibiocalcaneal fibers of the superficial deltoid ligament originate from the anterior colliculus of the medial malleolus and descend vertically to insert on the medial border of the sustentaculum tali [13]. This fascicle of the superficial deltoid has been shown to be the primary restraint against valgus tilting of the talus [13].

CONCLUSION

Careful patient selection and meticulous surgical technique, isolated STJ arthrodesis is a powerful procedure capable of significant radiographic improvements. The single lateral incision avoids iatrogenic trauma to the deltoid ligament while allowing direct visualization of the STJ facets. Careful cartilage resection preserving the overall architecture of the joint makes for easy manipulation of the hindfoot into a neutral position. Neutral position of the hindfoot is key to a successful procedure as it decreases stress on the medial soft tissue structures. Trauma and excess strain to the deltoid ligament can cause attenuation of the ligament leading to valgus tibiotalar ankle joint. The low incidence of ankle valgus deformity observed in this short-term study can be attributed to careful patient-procedure selection, precise neutral positioning of the STJ and incision placement that does not jeopardize the deltoid ligament.

References

1. Yu GV and Judge MS. Efficacy of subtalar joint arthrodesis for correction of pes valgo planus deformity: a retrospective evaluation. In: *Reconstructive Surgery of the foot and Leg*, Update 1998: 19-29
2. Hyer CF, Galli MM, Scott RT, Bussewitz B, Berlet GC. Ankle valgus after hindfoot arthrodesis: a radiographic and chart comparison of the medial double and triple arthrodeses. *The Journal of Foot and Ankle Surgery* 53(1):55-8, 2014.
3. Graves SC, Mann RA, Graves KO. Triple arthrodesis in older adults: results after long-term follow-up. *J Bone Joint Surg Am* 75:355-362, 1993.
4. Haskell, Andrew, Cynthia Pfeiff, and Roger Mann. Subtalar joint arthrodesis using a single lag screw. *Foot & ankle international* 25(11): 774-777, 2004.
5. Mirmiran, Roya, Brandon Wilde, and Michael Nielsen. Retrospective analysis of the rate and interval to union for joint arthrodesis of the foot and ankle. *The Journal of Foot and Ankle Surgery* 53(4): 420-425, 2014.
6. Knupp, Markus, Hanspeter Ledermann, Olaf Magerkurth, and Beat Hinterman. The surgical tibiotalar angle: a radiologic study. *Foot & ankle international* 26(9): 713-716, 2005.
7. Yu GV. The curettage technique for major rearfoot fusions. In *The Podiatry Institute reconstructive surgery of the foot and leg*, Update'93. Podiatry Institute, Tucker, GA, 1993.
8. Child, Brandon J., Joel Hix, Alan R. Catanzariti, Robert W. Mendicino, and Karl Saltrick. The effect of hindfoot realignment in triple arthrodesis. *The Journal of Foot and Ankle Surgery* 48(3): 285-293, 2009.
9. Yu G, Shook J, Sellars C, Judge M. Subtalar joint arthrodesis: a retrospective study. *Reconstructive surgery of the foot and leg*: update. 95:10-2, 1995.
10. Mäenpää, Heikki, Matti UK Lehto, and Eero A. Belt. What Went Wrong in Triple Arthrodesis?: An Analysis of Failures in 21 Patients. *Clinical orthopaedics and related research* 391: 218-223, 2001.
11. Miniaci-Coxhead, Sara Lyn, et al. Incidence and Radiographic Predictors of Valgus Tibiotalar Tilt After Hindfoot Fusion. *Foot & Ankle International* 38(5):519-525, 2017.
12. Resnick Ronald B., Melvin H. Jahss, Jack Choueka, Fred Kummer, Jonathan C. Hersch, and Enyi Okereke. Deltoid ligament forces after tibialis posterior tendon rupture: effects of triple arthrodesis and calcaneal displacement osteotomies. *Foot Ankle Int.* 16(1):14-20, 1995.
13. Song, Suzette J., Samuel Lee, Martin J. O'malley, James C. Otis, Hoon Sung, and Jonathan T. Deland. Deltoid ligament strain after correction of acquired flatfoot deformity by triple arthrodesis. *Foot & ankle international* 21(7): 573-577, 2000.

NATION'S 1ST HOSPITAL-BASED ADDICTION TREATMENT CENTER

**ST. VINCENT IS CLEVELAND'S
DOWNTOWN HOSPITAL**

**ROSARY HALL HAS BEEN AT THE FOREFRONT OF TREATING
ALCOHOLISM AND DRUG DEPENDENCY FOR MORE THAN 60 YEARS.**

Rosary Hall has assisted more than 65,000 drug-dependent and 110,000 alcohol-dependent men and women to breakthrough addiction with compassionate care.



**ST. VINCENT CHARITY
MEDICAL CENTER**

StVincentCharity.com *A Ministry of the Sisters of Charity Health System*



Is Cognitive Impairment Related to Peripheral Neuropathy?

By **Alex Dawoodian, DPM; Grace C. Craig, DPM; Michael B. Canales DPM**

ABSTRACT

It is known that peripheral neuropathy is often associated with long standing diabetes. Diabetic patients can experience a multitude of health conditions associated with the disease that pose difficulties in managing these complex patients. This study aims to explore the effects of peripheral neuropathy and cognitive impairment. A prospective study was conducted including 41 patients at a single institution (St. Vincent Charity Medical Center). The patients were separated into two groups consisting of diabetics with peripheral neuropathy and non-diabetics without peripheral neuropathy. A mini mental state exam (MMSE) questionnaire was provided to both groups of patients and they were asked to complete it.

Among the 41 subjects, 17 were diabetics with peripheral neuropathy and 24 were non-diabetics without peripheral neuropathy. Patients were selected based on a set of inclusion and exclusion criteria. Averages were obtained and a two sampled, one tail T-test was conducted to assess the statistical significance between the two groups. The average total MMSE score in the group of non-diabetics without peripheral neuropathy was 28.25 and the group of diabetics with peripheral neuropathy was 27.88. A T-test revealed a value of 0.305 (greater than 0.05). In the MMSE computational math section the control group (non-diabetics without peripheral neuropathy) had an average score of 4.33 and the group

Figure 1

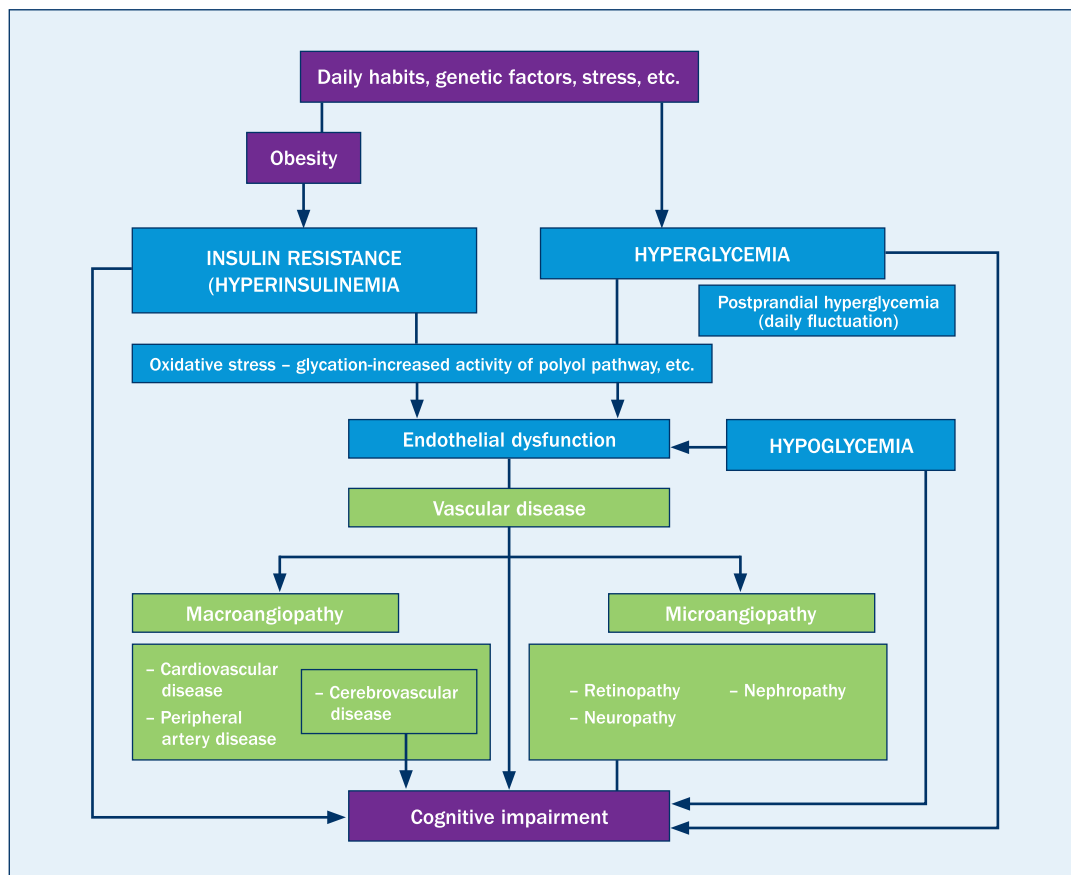


Fig 1. Proposed pathway for cognitive impairment in the face of diabetic peripheral neuropathy.

Kawamura et al. Curious relationship between cognitive impairment and diabetic retinopathy. *J Diabetes Invest* Vol. 6 No. 1 January 2015

of diabetics with peripheral neuropathy had an average score of 3.65 and a T-test score of 0.0382 (less than 0.05). Although a significant difference between total averages was not demonstrated, there existed an impairment with respect to the computational mathematics section of the diabetics with peripheral neuropathy compared to the control group of non-diabetics without peripheral neuropathy.

INTRODUCTION

The aging population faces a multitude of diseases that can impact cognitive function, ranging from Alzheimer's disease to alcoholism to cerebral vascular assaults. A lesser known disease affecting cognitive ability is diabetes mellitus. According to the International Diabetes Federation, there are an estimated 371 million people in the world diagnosed with diabetes [1]. A commonly known symptom

of diabetes mellitus is peripheral neuropathy. Neuropathy is a risk factor that can lead to neuropathic ulcers, which can lead to infected bone and associated soft tissue structures that can result in proximal limb amputation and even loss of life. Furthermore, peripheral neuropathy has been correlated with cognitive impairment. The pathway is not clearly understood, but it is theorized that poor glycemic control leads to oxidative

Figure 2

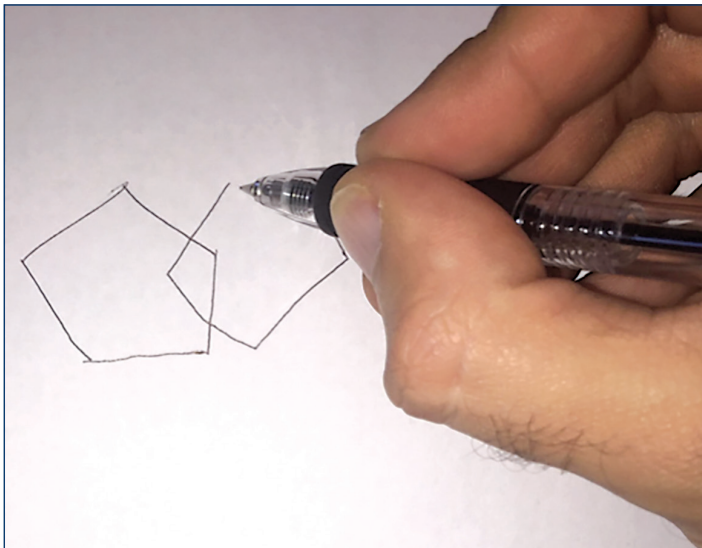


Fig 2. Patient being assessed for their motor function during the MMSE

stress, dyslipidemia and inflammation that impacts the central nervous system [2]. Another proposed mechanism is dysregulated insulin release resulting in accumulation of amyloid- β peptide (Ab), which follows a similar pathway of Alzheimer's disease [3].

It is troubling to think that a disease with such prevalence can lead to cognitive impairment. As the effects of diabetes worsen, patient compliance can diminish. A decrease in compliance can accelerate harmful symptoms, such as absent protective sensation, autonomic nerve impairment, painful neuropathy and Charcot neuroarthropathy. Clearly, a bleak cascade of events. This study aims to analyze a population of diabetics with peripheral neuropathy and non-diabetics without peripheral neuropathy to compare cognition in each group.

METHODS AND PROCEDURES

Subjects were provided with a questionnaire of subject age, his-

tory of diabetes, peripheral neuropathy, alcoholism, dementia, Alzheimer's disease and stroke. They were also asked if they had completed high school. All subjects were selected from a single institution (St. Vincent Charity Medical Center). Once the appropriate subject was selected, a mini mental state exam (MMSE) was provided to the patients [4]. Two testing groups were formulated. The control group included non-diabetic patients without peripheral neuropathy and the test group included diabetic patients with peripheral neuropathy. The MMSE score was based on a 30-point scale and each question was designated points based on the difficulty of the exam. Statistical analysis was performed and averages, standard deviations and a two sample T-test were calculated.

The inclusion criteria consisted of patients between the ages of 40-65, obtained high school diploma or General Equivalency Diploma (GED), as well as diagnosed with

Figure 3



Fig 3. Patient being assessed for peripheral neuropathy using the monofilament test

diabetes and peripheral neuropathy. The control group was composed of patients in the same age range who were not diabetic and who were not diagnosed with peripheral neuropathy. The exclusion criteria consisted of patients diagnosed with alcoholism, previous cerebrovascular assault, or transient ischemic attack, dementia, Alzheimer's disease and who did not obtain a high school diploma or GED. Subjects were identified based on information depicted in the electronic medical records. The study was explained to each subject and a consent form was completed by the patient. No payment or compensation was provided to the subjects. Results possessed no identifiable information which could be associated with specific individuals in the study.

RESULTS

Forty-one patients participated in this study. Among the 41 subjects, 17 were diabetics with peripheral neuropathy and 24 were non-dia-

betics without peripheral neuropathy. The average MMSE score for those in the control group of non-diabetics without peripheral neuropathy was 28.25 and the score for diabetics with peripheral neuropathy was 27.88. The standard deviation for the control group was 2.42 and the standard deviation for diabetics with peripheral neuropathy was 1.84. A one tail T-test was performed and revealed a value of 0.305 (greater than 0.05). The learning and memory recall, comprehension, and motor function sections were similar and neither group displayed deficits in the category. There was a difference between the two groups in the computation math section of the MMSE. The maximum score in the computation math section was 5 points. The non-diabetics without peripheral neuropathy group had an average score of 4.33 with a standard deviation of 1.21 compared to the group of diabetics with peripheral neuropathy who demonstrated an average score

| continued on p.16

Is Cognitive Impairment Related to Peripheral Neuropathy?

(cont. from previous page)

Figure 4

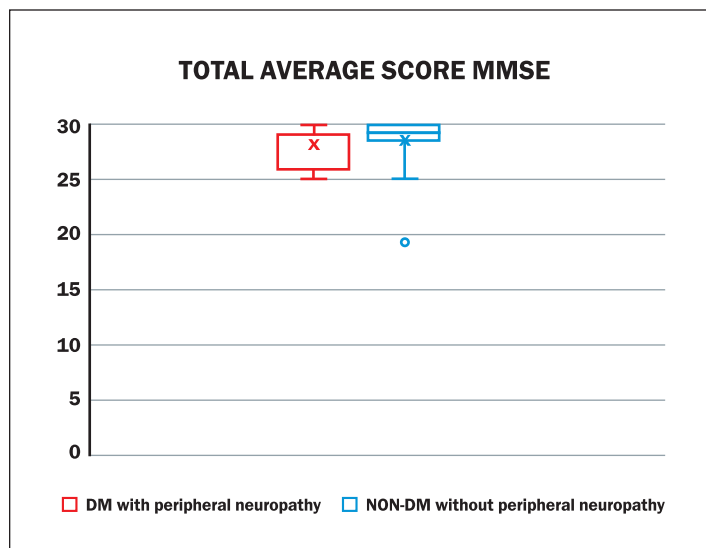


Fig 4. Total Average score of MMSE results comparing diabetics with peripheral neuropathy and non-diabetics without peripheral neuropathy. Maximum score is 30.

was 3.65 with a standard deviation of 1.08. A one tail T-test score was performed and revealed a value of 0.0382 (less than 0.05). There was a significant statistical difference between the two groups regarding the computation math section of the MMSE.

DISCUSSION

The results of the study revealed no significant statistical difference between the diabetic with peripheral neuropathy group and the non-diabetic group with respect to total average score of the MMSE. Despite previous literature demonstrating deficits in cognition in diabetics with peripheral neuropathy, this study did not demonstrate such a statistically significant deficit. It is possible the sample size of the diabetics with peripheral neuropathy was not large enough to measure the true effects of cognitive impairments. Difficulty was also encountered in selecting patients who met the inclusion

criteria, with the socioeconomic status of the diabetic patients posing difficulties. There were a large number of patients who did not earn a high school diploma or GED and were unable to answer various questions on the MMSE.

Interestingly, there was a statistically significant difference between the diabetics with peripheral neuropathy and the non-diabetics without peripheral neuropathy with respect to the average score of the computational mathematics section of the MMSE. This section required the patient to compute basic arithmetic, which showed a significant decrease in the diabetics with peripheral neuropathy test group. Furthermore, motor function, comprehension, learning and memory recall were well maintained in both test groups, which suggested that diabetic peripheral neuropathy had not affected these areas of cognition.

Diabetes is an epidemic and the disease creates challenges for

Figure 5

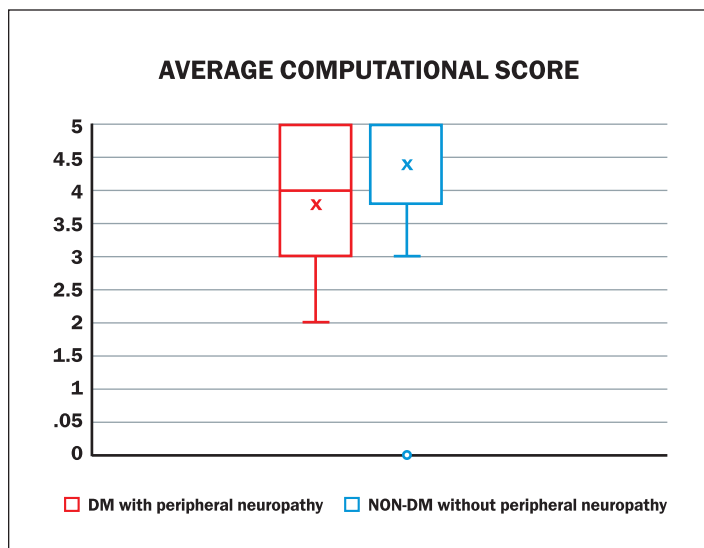


Fig 5. Total Average computational score portion of the MMSE. Comparing diabetics with peripheral neuropathy and non-diabetics without peripheral neuropathy. Maximum score is 5.

the health care provider. Diabetes is complicated by a variety of comorbidities, such as peripheral neuropathy, retinopathy, nephropathy and many more comorbidities known to diabetics. In this study's cohort, many diabetics had suffered transient ischemic assaults and/or cerebrovascular assaults, of which some were still undergoing rehabilitation therapy. Naturally, many diabetic patients were excluded from the study due to the direct effect on their MMSE performance. In a study performed by Perlmuter et al. there was a decline in cognitive function for neuropathic diabetic patients who were assigned tasks requiring learning and memory [5]. Although Perlmuter's study did not elucidate the direct pathway leading to cognitive impairment, it was suggested that chronic diabetics acquire a significant amount of microvascular disease, which could collectively have effects on cognition.

Interestingly, another study

conducted by CM Ryan et al., demonstrated that subjects had decreased psychomotor functions, however learning, memory and problem-solving skills remained largely intact [6]. Perhaps peripheral neuropathy has a more severe impact on cognition in individuals who did not possess a background of intellectually stimulating careers. The study creates an analogy that the brain acts as a muscle and those with years of intellectually taxing careers may not be as adversely affected by peripheral neuropathy as they have continued to utilize the skill of cognition for years. Another factor affecting cognition could be the duration of peripheral neuropathy.

The exam parameters itself could not be an accurate representation. The MMSE predominantly measures cognition in the setting of dementia. It may be more helpful to provide patients with more critical thinking tasks that can determine if cognition is

Figure 6

Mini-Mental State Examination (MMSE)

Patient's Name _____ Date _____

Instructions: Score one point for each correct response within each question or activity.

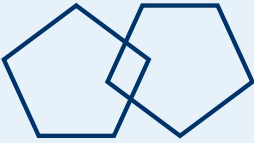
Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day? Month?"
5		"Where are we now? State? Country? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then the instructor asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible.
5		"I would like you to count backward from 100 by sevens." Alternative: Spell WORLD backwards."
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and verb.)
1		<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol to the right. All 10 angels must be present and two must intersect.)</p> </div> <div style="flex: 1; text-align: center;">  </div> </div>
30		TOTAL

Fig 6. Mini Mental State Exam patients completed during the study

impaired. This would require additional exam parameters and further analysis. It has been suggested that simple multiple choice and rote memorization does

not provide an accurate view of critical thinking and that testing should be more open ended. KYL Ku suggested that a new trend in measuring cognitive ability is a

combination of multiple choice and essay exams. Nonetheless, it is also difficult to standardize such tests as each format possesses its own inconsistencies from one

test group to the next. Popular testing methods such as the Watson-Glaser Critical Thinking Appraisal and the Ennis-Weir Critical Thinking Essay Test have been widely used, but still contain discrepancies from one test group to the next and have been reported to be one dimensional critical thinking tests [7]. Further study to accurately ascertain cognitive ability could incorporate multiple open ended and multiple-choice type tests which can gauge the level of cognitive impairment and be useful in future studies to differentiate between diabetics with peripheral neuropathy and non-diabetics without peripheral neuropathy.

References

1. <https://www.idf.org/>
2. Rodrigo O. Moreira et al. Is cognitive impairment associated with the presence and severity of peripheral neuropathy in patients with type 2 diabetes mellitus? *Diabetology & Metabolic Syndrome* (2015) 7:51
3. Kawamura et al. Curious relationship between cognitive impairment and diabetic retinopathy. *J Diabetes Invest* Vol. 6 No. 1 January 2015
4. Folstein MF, Folstein SE, McHugh PR: "Mini-mental state: A practical method for grading the cognitive state of patients for the clinician." *J Psychiatr Res* 12:129-138.
5. LC Perlmuter et al. Decreased cognitive function in aging Non-insulin-dependent diabetic patients. *The American Journal of Medicine*, Vol 77. 1984
6. CM Ryan, MO Geckle. Circumscribed cognitive dysfunction in middle-aged adults with Type 2 diabetes. *Diabetes Care* 23: 1486-1493, 2000
7. Kelly Y.L. Ku Assessing students' critical thinking performance: Urging for measurements using multi-response format. *Thinking Skills and Creativity* 4 (2009) 70-76



WOMEN'S CHOICE
AWARD®

SELECTED BY WOMEN AS ONE OF
**AMERICA'S BEST
HOSPITALS**
FOR ORTHOPEDICS

**ST. VINCENT IS HONORED TO HAVE EARNED THE
WOMEN'S CHOICE AWARD FOR ORTHOPEDIC SURGERY.**

St. Vincent Charity Medical Center was named one of the best healthcare institutions for orthopedic care based on criteria for female satisfaction and clinical excellence. Our Spine and Orthopedic Institute ranks in the top 11% of U.S. hospitals reviewed.



SPINE AND
ORTHOPEDIC INSTITUTE
ST. VINCENT CHARITY MEDICAL CENTER

StVincentCharity.com A Ministry of the Sisters of Charity Health System

Pain in the Neck: A Case of Strap Muscle Pyomyositis in a Patient with Selective IgM Deficiency

(cont. from page 5)

Pathogenesis of pyomyositis remains unclear as striated muscles are intrinsically resistant to bacterial proliferation. Studies have linked a history of trauma and release of iron from myoglobin as a possible predisposing condition to this disease [4]. In developing countries, cases of pyomyositis have been described more in younger, healthy individuals without any chronic medical conditions, leading investigators to believe underlying occult muscle injury from viral or parasitic infections, and nutritional deficiencies, to be contributing factors [5]. On the other hand, individuals with pyomyositis in developed countries, such as the United States, were more likely to have chronic medical conditions, including malignancies, diabetes, immunologic and rheumatological illnesses [1]. In our case, the patient presented with severe multilobar pneumonia, bacteremia and pyomyositis despite an unremarkable

past medical history. This unusual presentation prompted evaluation of the patient's immune status and led to the diagnosis selective IgM (SIgM) deficiency.

SIgM deficiency is a rare form of dysgammaglobulinemia characterized by an isolated low levels of serum IgM. Estimated prevalence of SIgM is about 0.26% among U.S. adults. [6,7]. SIgM deficiency is either primary or secondary (acquired). The acquired form, which is more common than the primary type, may be associated with immunosuppressive therapy, gastrointestinal conditions, malignancy and autoimmune conditions [8]. The primary form is typically diagnosed in children presenting with severe recurrent infections due to encapsulated bacteria and viruses. Our patient had no prior recurrent infections and fit in the picture of the acquired form.

Patients with SIgM deficiency who present with severe infec-

tions may benefit from fresh frozen plasma in addition to aggressive antibiotic therapy. Patients who are determined to have defective antigen specific IgG response may need intravenous immunoglobulin (IVIG) replacement [9,10].

CONCLUSION

This case highlights the importance of keeping pyogenic myositis on the list of differentials in a patient presenting with localized muscle pain and symptoms suggestive of systemic infection. A diagnosis of pyomyositis in an individual with no obvious immunocompromising conditions should prompt investigation for SIgM deficiency. Early diagnosis and prompt treatment can prevent the potentially catastrophic complications of this condition.

References

1. Crum NF. Bacterial pyomyositis in the United States. *Am J Med.* 2004 Sep 15; 117(6):420-8.

2. Christin L, Sarosi GA. Pyomyositis in North America: case reports and review. *Clin Infect Dis* 1992;15:668-77.
3. S Chauhan, S Jain1, S Varma1, S S Chauhan. Tropical pyomyositis (myositis tropicans): current perspective. *British Medical Journal*, 2003. Vol 80, Issue 943
4. Block AA, Marshall C, Ratcliffe A, Athan E. Staphylococcal pyomyositis in a temperate region: epidemiology and modern management. *Med J Aust* 2008;189:323-325.
5. Chiedozi LC. Pyomyositis: review of 205 cases in 112 patients. *Am J Surg* 1979;137:255-259.
6. Goldstein MF, Goldstein AL, Dunsky EH, Dvorin DJ, Belecanech GA, Shamir K. Selective IgM immunodeficiency: retrospective analysis of 36 adult patients with review of the literature. *Ann Allergy Asthma Immunol.* 2006 Dec. 97(6):717-30.
7. Sorensen RU, Moore C. Primary immune deficiencies: presentation, diagnosis, and management. *Pediatr Clin North Am.* 2000. 47:1240.
8. Louis AG, Gupta S. Primary selective IgM deficiency: an ignored immunodeficiency. *Clin Rev Allergy Immunol.* 2014 Apr. 46(2):104-11.
9. Zaka-ur-Rab Z, Gupta P. Pseudomonas septicemia in selective IgM deficiency. *Indian Pediatrics.* 2005. 42:961-2.
10. Yel L, Ramanuja S, Gupta S. Clinical and immunological features in IgM deficiency. *Int Arch Allergy Immunol.* 2009. 150(3):291-8. [Medline].

Connecting the Dots—Acute Abdomen, ST Elevation and a Consolidating Lung Mass

(cont. from page 6)

CONCLUSION

Community acquired pneumonia, though a common diagnosis, can be clinically challenging to recognize. Alarming presentation like acute abdomen and ACS can be misleading to the physician. CAP should be considered in the differential diagnosis of acute abdomen in an adult patient. Our case further emphasizes the need to interpret abnormal EKG with the clinical context to avoid unnecessary testing and

procedures that may delay diagnosis and treatment.

References

1. Streptococcus pneumoniae and community-acquired pneumonia: a cause for concern. *File TM JrAm J Med.* 2004 Aug 2; 117 Suppl 3A():39S-50S
2. Hayes R. Abdominal pain: general imaging strategies. *Eur Radiol.* 2004 Mar;14(Suppl. 4):L123-L137
3. Tsalkidis A., Gardikis S., Cassimos D. Acute abdomen in children due to extra-abdominal causes. *Pediatr Int.* 2008;50(3):315-318.
4. Armeni E, Mylona V, Karlis G, Makrygiannis E. Pneumonia pre-

5. Stein, Paul D. et al. Electrocardiogram in Pneumonia. *American Journal of Cardiology*, Volume 110, Issue 12, 1836 - 1840





ST. VINCENT CHARITY
MEDICAL CENTER

JOURNAL

2351 EAST 22ND STREET
CLEVELAND, OHIO 44115
P. 216 861 6200
stvincentcharity.com

A Ministry of the Sisters of Charity Health System

NON-PROFIT ORG.
U.S. POSTAGE
PAID
CLEVELAND, OH
PERMIT NO. 2615