Inside This Issue

- Pancreatitis
- Pediatric Acute Hematogenous Osteomyelitis
- Back to the Basics: Calcium and Phosphorus 101
Contents

4  Article 416  
Pancreatitis  
George H. Roberts

11  Questions for Article 416

14  Article 417  
Pediatric Acute Hematogenous Osteomyelitis  
Vicki Pyles

19  Questions for Article 417

20  Article 418  
Back to the Basics: Calcium and Phosphorus 101  
George H. Roberts

23  Questions for Article 418

24  Consultants Corner  
Why CLC Certification?  
Bev Charlton

26  Abstracts From the Current Literature

30  AMT Directory

Editor  
Gerard P. Boe, PhD

Associate Editor  
Diane Powell

Business Office  
American Medical Technologists  
10700 W. Higgins Rd., Suite 150  
Rosemont, IL 60018  
847-823-5169  
e-mail address: mail@americanmedtech.org  
Web Site: http://www.americanmedtech.org

Journal of Continuing Education Topics & Issues (ISSN 1522-8606) is published in January, April, and August under the sponsorship of the American Medical Technologists, 10700 W. Higgins Rd., Suite 150, Rosemont, Illinois 60018. Copyright 2015 by American Medical Technologists. Subscriptions include three issues of Journal of CE Topics & Issues and three issues of AMT Events: $50.00/year + $10 postage for foreign countries. Members may not deduct subscription price from dues. Postmaster: Please send change of address to AMT, 10700 W. Higgins Rd., Suite 150, Rosemont, Illinois 60018. Moving? Be sure AMT publications move with you. Send your new address and old mailing label from an AMT publication to AMT six weeks before you move.

Cover photo: Firestorm microscape, © Eric Clark, National High Magnetic Field Laboratory, Florida State University, Tallahassee.
Case Study

This case study involves a 53-year-old white male seen in his primary care physician’s office for a sudden onset of acute chest pain. The patient was admitted to a local hospital for diagnostic studies related to the pain. Cardiac enzymes, stress test, and a heart catheterization study were all normal. The pain subsided and the patient was discharged. The patient continued to see his primary care physician with recurrent episodes of acute chest pain and was eventually referred to a gastroenterologist for evaluation. The patient is a non-smoker and a non-drinker.

The gastroenterologist ordered an amylase and lipase. The amylase was and has remained normal over the years except for one acute exacerbation of pain when it elevated to 4 times the upper limit of normal. The lipase was and has remained elevated over the years ranging from just slightly abnormal to 30 times the upper limit of normal.

The initial diagnosis was that the pancreatitis was due to acute gallbladder disease though there were no stones. The gall bladder was removed and the pain subsided for a period of time. Pain once again began to occur. An endoscopic retrograde cholangiopancreatogram (ERCP) was performed and indicated a thickening of the pancreatic duct. A stent was inserted and brought about temporary relief. Pain recurred. Another ERCP was performed and a sphincterotomy successfully completed.

The patient continues to suffer intermittent bouts of pancreatitis indicated by elevations of serum lipase levels and has been diagnosed with idiopathic chronic pancreatitis which the patient has learned to live with and control the pain of with over-the-counter analgesics, Nexium, and hydrocodone as needed when pain becomes severe enough.

Introduction

The pancreas is a large, flat gland located in the abdomen behind the stomach and close to the duodenum. The pancreas plays an important role in both digestion (exocrine) and metabolism (endocrine). The part of the pancreas with endocrine function (secretes hormones in blood stream to travel to other sites in the body for activity) is made up of the islets of Langerhans which are composed of four different types of cells: alpha cells secrete glucagon; beta cells secrete insulin; delta cells secrete somatostatin; and, gamma cells secrete pancreatic polypeptide. Glucagon acts to increase blood glucose levels while insulin acts to decrease blood glucose levels. Somatostatin regulates the activity of both the alpha and beta cells. Pancreatic polypeptide functions to regulate both endocrine and exocrine pancreatic secretion activities (http://www.mayoclinic.com/health/pancreatitis/DS00371).

The acinar cells of the pancreas produce and transport a variety of chemical compounds called proenzymes which are stored in zymogen granules that exit the body via the digestive system where the proenzymes are converted into active enzymes and assist in the digestion
Case Presentation

An 8 year old male presents with fever, chills, malaise, fatigue and pain over the left clavicle. The patient has been experiencing decreased range of motion of left arm due to pain. There is no report of recent trauma and no reported significant previous medical history.

Upon palpation during physical examination, tenderness is present over the medial aspect of the left clavicle with mild soft tissue swelling. Edema and erythema are present. The patient moves all extremities well but does not wish to move the left arm.

Laboratory findings reveal a normal WBC count with a left shift; 73 neutrophils, 16 bands and 1 metamyelocyte. ESR and CRP are both elevated at 38 and 12.40 respectively. X-ray of the left clavicle indicates no recent fracture or dislocation. MRI findings are consistent with osteomyelitis, sternoclavicular septic arthritis and soft tissue abscess.

Culture results from the incision and drainage indicate Staph sensitive bacteria. The patient is started on appropriate antibiotic treatment. After five days of IV antibiotics, a PICC line is placed, allowing the patient to be discharged while continuing with the antimicrobial therapy.

Abstract

Acute hematogenous osteomyelitis (AHOM) is a serious pyogenic infection of rapid onset primarily in children; affecting nearly 7% of children with boys twice as often as girls. The long bones of the lower extremity are the most commonly involved, although any bone may be affected. Because Staphylococcus aureus is responsible for approximately 70% of AHOM cases, empirical therapy is usually directed against this pathogen. Prompt diagnosis and appropriate treatment greatly reduce the risk of long term sequelae.

Introduction

Osteomyelitis (OM) by definition is any inflammation of the bone often as a result of bacterial infection. There are three ways infection of the bone can occur:

• hematogenous seeding from bacteremia
• direct introduction as a result of trauma or surgery
• contiguous spread from nearby infected tissue

Osteomyelitis is categorized as either acute or chronic according to duration but more importantly by histopathological findings. With chronic osteomyelitis, patients often do not display symptoms until up to six weeks after invasion of the infective agent. The presence of necrotic bone is the primary histopathological finding related to chronic infection. Often, chronic osteomyelitis develops secondary to contiguous soft tissue infection, likely due to the increase in the number of diabetic patients with foot infections and peripheral vascular disease.

Acute OM, more common in children, can result in inflammatory bone changes and symptoms appear more rapidly, usually within fourteen...
Introduction

Disorders of calcium metabolism are usually associated with alterations of phosphorus (as inorganic phosphate). Therefore, the metabolism of these two substances will be considered together.

Calcium and phosphorus enter the body via the gastrointestinal tract and are absorbed by the small intestine with the aid of vitamin D and parathyroid hormone (PTH). Absorption is enhanced by the acid pH of the intestine.

Calcium is involved in a variety of roles in human physiology. In bone, calcium combines with phosphorus to form hydroxyapatite crystals that give strength to bone structure and provide a reservoir of calcium for the remainder of the body. Ninety-nine percent of the calcium and 80% of the phosphorus in the body are associated with the skeletal system. Therefore, from a quantitative point of view, the most important function of calcium and phosphorus is in the maintenance of skeletal structure. Calcium also functions in blood coagulation (factor IV), muscle contraction, enzyme activation, and membrane permeability. Phosphorus is a necessary component of nucleic acids, phospholipids, adenosine triphosphate (ATP), and a number of carbohydrate intermediates. Calcium and phosphorus utilized in these processes are in constant equilibrium with their circulating concentrations.

Reference Ranges

Reference ranges for serum calcium are dependent on the laboratory methodology and instrumentation utilized and should be interpreted in the context of that individual laboratory’s reported reference range. In general, the reference range for calcium is approximately 8.5 – 10.5 mg/dL in adults and 10.5 – 12.5 mg/dL in growing children. The reference range for phosphorus in adults is between 2.5 – 4.5 mg/dL and 4.5 – 6.5 mg/dL in growing children. Healthy adults with average diets excrete phosphorus at the rate of 900 - 1300 mg/24 hours and calcium at a rate of 30 – 150 mg/24 hours.

Forms of Calcium

Calcium is found in the blood in three forms: (1) ionized (50%), (2) protein-bound (45%), and (3) complexed (5%). The protein-bound fraction is bound predominately to albumin while the remainder is bound to globulins. The complexed form is loosely bound to citrate, phosphate, and sulfate. The ionized form is biologically active and has been termed diffusible calcium. In cases of acidosis the ionized form increases while in alkalosis the ionized form decreases. Plasma protein concentration and pH help to determine the amount of ionized calcium in the blood.

Regulation of Calcium

Several factors are involved in the regulation of serum calcium and as a general rule, these factors also affect serum phosphorus. There are three hormones that can be considered controlling hormones since the concentration of these hormones is altered in response to serum calcium levels. The first hormone is parathyroid hormone (parathormone, PTH), which is stimu-
Continuing Education Opportunities

AMT strongly advocates lifelong learning as a part of your personal and professional growth. Take a look at the great CE opportunities that AMT has to offer!

STEP Online

STEP Online consists of short scholarly articles on a variety of topics and a 10-question quiz. While the articles and quizzes are available online, they also appear in the Journal of Continuing Education Topics & Issues. A nominal fee is assessed for the quiz, taken either online or manually.

**Topics**

- Clinical Practice
- Disease States
- Management
- Medical Assisting
- Phlebotomy
- Laboratory (by discipline)

On-Demand Courses

On-demand courses are offered on timely topics and are available 24/7. Each course consists of an audio-presentation synched with PowerPoint slides. To receive credit, the participant must successfully pass a 10-question quiz. A nominal member fee applies.

- Is Your OSHA Program Up-To-Date?
- Colorectal Cancer Screening: Early Detection Can Lead to Prevention
- Medical Assisting: Are You Doing What You are Supposed to be Doing?
- Medical Errors/HIPAA (HITECH Act)
- Clinical Microbiology-Case Studies
- D-Dimer and its Application in Suspected VTE
- Critical Thinking and Problem Solving for Medical Assistants
- Followership: You Choose Your Path
- PSA, Free PSA, Complex PSA and Prostate Cancer
- Vitamin D -- Why all the Fuss?
- Medical Errors in Healthcare Settings
- Dealing with Difficult People
- Update on Aspirin and Plavix Sensitivity and Resistance Testing
- Leadership & Mentorship
- Lean Six Sigma Implementing 5 S in the Laboratory
- ECG and its Use for Diagnosing Cardiac Conditions
- Stress Management in the Workplace

Webinars

Webinars are available on a variety of topics. Originally scheduled live, they are archived after each live presentation and are then available 24/7. To receive credit, the participant must successfully pass a 10-question quiz. A nominal member fee applies.

**Topics**

- Professionalism in the Workplace
- IDEAL Communication: The Art of Conflict Resolution
- Improving Listening Skills
- Ethics in Health Care
- The Health Care Law and You