The free form is the active form of the mineral. Alterations in circulating protein levels (mostly albumin) and acid-base status will alter the interpretation of magnesium status (very similar to calcium). A decrease in albumin will lower total serum levels without affecting the ionized level. Alkalosis will increase protein binding of magnesium while acidosis will decrease it. We previously reported that most patients with low total serum magnesium levels actually had normal ultrafilterable (ionized plus chelated) levels. We have found that most patients with postoperative- or postresuscitation-induced decreases in serum albumin concentrations maintain normal ultrafilterable magnesium levels (and ionized calcium levels) despite decreases in total serum levels. Thus, low serum magnesium levels may not indicate cellular magnesium deficiency and tissue magnesium deficiency may exist with normal serum magnesium levels.

Magnesium may have a large variety of pharmacologic effects and reversal of signs and symptoms with magnesium treatment is not a good indicator of deficiency. Magnesium is frequently used in normomagnesemic patients for its antiarrhythmic and neuronal effects. Reversal of hypokalemia or hypocalcemia with magnesium administration may indicate tissue deficiency, but has not been rigorously tested.

The physiologic effect of mild decreases in extracellular magnesium concentrations requires further study. There is no direct relationship between intracellular and extracellular levels of magnesium. As a result, it is difficult to predict the cellular effects of low circulating magnesium based upon the level alone. The effects of acute decreases also differ from effects of chronic decreases. Acute decreases in serum magnesium concentration in the face of preserved serum protein levels may be associated with cardiac arrhythmias and neuronal irritability as a result of altered membrane potential, whereas chronic decreases may be better tolerated (similar to potassium changes). It is possible that mild decreases in circulating ionized magnesium have minimal, if any, acute effects on cellular function. A better understanding of cellular magnesium metabolism and the effects of altered circulating levels upon cellular function is clearly needed.

Information regarding magnesium activity is key to our understanding of magnesium metabolism. At present there is no one laboratory test which unequivocally reveals magnesium deficiency. In addition, there does not appear to be a specific magnesium deficiency syndrome, but rather a spectrum of nonspecific neuromuscular, gastrointestinal, and cardiovascular manifestations which may in part result from concomitant calcium and potassium changes. Definite conclusions regarding the physiologic effects of hypomagnesemia may be revealed when free electrolyte levels can be related to organ function.

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Intravenous Dipyridamole Infusion Causes Severe Bronchospasm in Asthmatic Patients

Intravenous dipyridamole-thallium stress testing is gaining increasing recognition as an alternative method of assessing risk of cardiac ischemic events in patients who are unable to perform conventional treadmill or bicycle exercise stress testing. While the overall safety of this test is excellent, occasional patients have experienced untoward side effects from dipyridamole. The better known adverse reactions are angina, gastrointestinal symptoms, headache, and dizziness. Of these, only angina is potentially serious. We have recently encountered two patients who developed a less common but also potentially serious side effect, bronchospasm, following intravenous dipyridamole infusion. In one of these cases, respiratory arrest necessitated emergent intubation.

The mechanism by which intravenous dipyridamole produces coronary artery vasodilation has relevance in considering its potential to produce bronchospasm. Dipyridamole's coronary vasodilatory effect results from its inhibition of myocardial cellular and endothel-
lial uptake of endogenously produced adenosine\textsuperscript{4-6} which then accumulates in the interstitium and plasma\textsuperscript{7} and causes coronary vasodilation. This effect is seen on both large coronary arteries, as well as the smaller coronary resistance vessels.\textsuperscript{4}

Adenosine has also been shown to have effects on other organs, and in particular, the central nervous system and lung. Adenosine applied directly to the central nervous system produces depression of respiration.\textsuperscript{8} This effect is mediated predominantly by binding of adenosine to high-affinity extracellular receptor sites, an action which is competitively antagonized by methylxanthenes such as theophylline.\textsuperscript{5,9}

More important, adenosine selectively causes bronchospasm in patients with asthma, while in normal subjects no such effect is observed.\textsuperscript{10} The precise mechanism of this effect is as yet undetermined, but once again the result is preferentially antagonized by administration of theophylline.\textsuperscript{10} The response of our two patients to intravenous dipyridamole is suggestive that through either a central effect, or more likely, a primary pulmonary response, adenosine accumulation resulted in sudden, severe bronchospasm.

The incidence of serious adverse reactions during intravenous dipyridamole-thallium testing is low. In our own laboratory, where we have tested more than 800 patients, we have seen only these two incidents of marked bronchospasm. Furthermore, the manufacturer reports only two instances where bronchospasm was severe enough to result in intubation out of more than 3,900 patients tested.\textsuperscript{11} In both instances, the patients had known asthma. The risk of important bronchospasm following dipyridamole administration in patients with chronic lung disease but without known asthmatic tendencies appears to be low. When bronchospasm has occurred, it has been rapidly and effectively reversed with intravenous aminophylline.

These observations have prompted us to pay careful attention to a history of asthma and/or bronchodilator use in patients being considered for intravenous dipyridamole-thallium stress testing. In patients with known asthma, the importance of the potential diagnostic/prognostic information to be obtained from the test must be carefully weighed against the potential risk of bronchospasm. If a decision to proceed with the test is made, intravenous aminophylline should be readily available in case untoward side reactions occur.

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\textbf{Bronchoscopy in Chest}

Over the years, several areas in cardiopulmonary diseases have expanded tremendously and gradually established their own niches. Chest recognized this trend and appropriately established various "departments" to represent these areas and to provide timely and valuable information to the readers. Some of the examples include Clinical Problems in Cardiopulmonary Disease, Critical Care, Exercise and the Heart, Medical Imaging, Occupational and Environmental Lung Disease, and Risk-Benefit Analysis in Chest Medicine. The success of these departments has prompted introduction of another department, and commencing with this issue, Chest will publish a series of articles on a periodic basis under the banner, Bronchoscopy.

Why a special department for bronchoscopy? After all, the procedure has long been in use and has become an indispensable tool for the practicing pulmonologist and is the third most commonly used invasive procedure, after arterial blood gases and thoracocentesis, in pulmonology. While there are many excellent papers on original investigation in the field, the dearth of