approximates central aortic systolic pressure than does a direct arterial recording at the same site or from the radial artery.

In clinical exercise testing, a key function of blood pressure monitoring is to detect exercise-induced hypotension. This has been defined as failure of the systolic blood pressure to increase progressively with increasing workload and, in patients with coronary artery disease, it is usually indicative of multivessel or left main obstruction. Because it may be associated with unexpected ventricular fibrillation, falling blood pressure level is an immediate indication for terminating an exercise study.

In view of the difficulties inherent in obtaining an accurate sphygmomanometer reading during strenuous exercise, the relative ease and reliability of direct arterial blood pressure measurement has much to recommend it. This is particularly true if a radial catheter has already been inserted for the purpose of arterial blood gas sampling. It is important to remember, however, that current knowledge concerning the clinical correlates of exercise-induced hypotension is based almost entirely upon studies in which sphygmomanometry, and not a radial artery catheter, was used to measure blood pressure. Since it is central aortic and not peripheral blood pressure which influences cardiac work and coronary blood flow, it is possible that the brachial cuff pressure—which more accurately reflects central aortic pressure—is also the more sensitive barometer of life-threatening hemodynamic or arrhythmic events. In any event, recommendations regarding clinical use of direct radial pressure in the exercise laboratory must await documentation of its reliability in detecting exercise-induced hypotension.

Blood pressure is also monitored in the exercise laboratory to determine the effect of exertion on a number of important physiologic parameters. Indices designed to estimate myocardial oxygen demand—such as the heart rate-blood pressure product—utilize systolic blood pressure in their calculation and would be most accurate if central systolic pressure measurements were used. In the setting of the exercise laboratory, this translates into superiority of the brachial cuff, over direct radial pressure in making the estimation.

The converse is true when one looks at peripheral vascular resistance, which is determined using the measurement of mean arterial blood pressure. In estimating mean pressure with sphygmomanometry, one must utilize the diastolic blood pressure reading. Numerous studies have shown, however, that the correlation between directly measured and cuff diastolic blood pressure at rest is less dependable than for systolic pressure, and diastolic pressure becomes increasingly difficult to detect with any degree of reliability whatsoever during exercise. The result is that estimation of mean arterial pressure, and hence peripheral vascular resistance, will be extremely unreliable if sphygmomanometry is used. In this instance, direct radial artery pressure is much more useful since it furnishes, both at rest and during exercise, a more accurate representation of mean arterial blood pressure.

In summary, where and how one chooses to measure blood pressure is extremely important. For determining myocardial work in the exercise laboratory, brachial sphygmomanometry is clearly preferable despite its limitations. Where accurate information regarding peripheral vascular resistance is required, direct monitoring of radial artery pressure provides more reliable results. The relative sensitivity of each method in detecting exercise-induced hypotension is presently unknown.

Alan H. Gradman, M.D.
New Haven

Cardiology Section, Yale University School of Medicine.

Reprint requests: Dr. Gradman, Chief, Cardiology/111B, West Haven VA Medical Center, West Haven 06516

REFERENCES
3 Morris SN, Phillips JF, Jordan JW, McHenry PL. Incidence and significance of decreases in systolic blood pressure during graded treadmill exercise testing. Am J Cardiol 1978; 41:221-26

The Treatment of Lung Abscess
Current Concepts

The definitive treatment of an abscess is incision and drainage. Lung abscesses will also respond to such treatment, but incision and drainage are complicated by the negative pressure within the pleural space and the danger of collapse of the lung if the pleural space is exposed to atmospheric pressure. Fortunately, most pulmonary abscesses arise in the periphery of the lung. It is not uncommon to have the inflammatory reaction surrounding the abscess cavity extend to the visceral pleura and, subsequently, to the adjacent parietal pleura, thus producing a symphysis between the two pleural surfaces. In this situation, the abscess

See article on page 731

CHEST / 87 / 6 / JUNE, 1985 709
can be effectively drained percutaneously, a method of treatment known to and practiced by Hippocrates. However, the treatment is only successful if a pleural symphysis has formed. The importance of a pleural symphysis was recognized by late 19th century and in the 1920s and 30s surgeons were producing a pleural symphysis prior to incision and drainage of the abscess. A short segment of the rib overlying the abscess was excised subperiosteally and an irrigant such as a strip of gauze was placed into the incision to produce a pleural symphysis. Four to five days later a tube could be inserted into the underlying abscess without danger of collapse of the surrounding lung.

Incision and drainage remained the standard form of therapy until the advent of anesthesia techniques and equipment which permitted open thoracotomy in the early 1940s. For a brief period of time, the treatment of choice for lung abscess was resection via segmental resection or lobectomy. With the advent of effective antibiotics, however, incision and drainage of a lung abscess or excision of the abscess became virtually unnecessary. Numerous clinical studies demonstrated that these abscesses heal with appropriate antibiotic therapy in the majority of patients.

An occasional patient with a lung abscess is encountered, however, who remains septic in spite of appropriate antibiotic therapy and radiographic evidence of an abscess cavity persists. If the patient is able to tolerate a thoracotomy and lobectomy or segmental resection, this is the procedure of choice. These procedures (under general anesthesia) should be accomplished with a double lumen endotracheal tube in order to prevent the spillage of purulent material into the opposite lung.

A small percentage of patients with lung abscess will not tolerate an extensive operative procedure. In the past, the majority of these patients have had far advanced pulmonary disease. More recently, the situation is more commonly encountered in patients with malignant disease who are being treated with chemotherapy and/or radiation. In this type of clinical situation, percutaneous incision and drainage is the procedure of choice. If there is firm radiographic evidence of a pleural symphysis, then insertion of a tube can be accomplished primarily under local anesthesia. If there is any question, however, as to the absence of a pleural symphysis, it is necessary to establish such a symphysis as previously described. The majority of these patients will respond to incision and drainage and the tube can be removed over a period of time.

R. Robinson Baker, M.D.
Baltimore

---

The Persistent Need to Improve our Approach to Sarcoidosis

Our understanding of the basic inflammatory processes involved in the pathogenesis of pulmonary sarcoidosis has greatly increased in the past ten years. This has accompanied the introduction of three new laboratory tests which presumably reflect directly the interstitial inflammatory process without resorting to repetitive pulmonary biopsies, namely, (semi)quantitative gallium 67 lung scanning, measurement of serum angiotensin I-converting enzyme activity, and determination of the proportion of helper T-lymphocytes recovered by bronchoalveolar lavage.1-5 Initially, it was believed that these tests were highly specific for sarcoidosis and would serve as the long-awaited biologic markers of the disease, alone or in combination.1,2,4,6 Unfortunately, it is clear now that they are not specific and offer much less diagnostic help than was expected.7,8 The diagnosis of sarcoidosis is still one of exclusion and requires supporting histologic evidence of noncaseating granulomas.

These novel laboratory techniques were originally considered as sensitive, objective, quantitative, and reproducible tests for monitoring the kinetics of the inflammatory process in the lungs of patients with sarcoidosis in "real time."8,9,10 This added insight enabled us to identify early in the course of the disease those patients with the so-called active (high-intensity) alveolitis who were thought to be at greater risk of developing pulmonary fibrosis and death from respiratory failure, cor pulmonale, or aspergilloma.4,8 These new tests were considered simpler, more specific indicators of the activity of the disease than the more traditional methods of clinical assessment, chest roentgenogram, and pulmonary function tests.1,4,10 The conventional examinations are only indirect signs of inflammation and, therefore, imprecise reflections of the activity of the interstitial inflammatory process in the lung.

From currently available data in the literature, it seems that these so-called sarcoid-specific tests did not fulfill those expectations. To date, there is little evidence, based on large-scale prospective studies, that these tests are superior in any practical respect to the traditional and more conventional methods of clinical assessment in pulmonary sarcoidosis.7,9,11-13 Furthermore, we still cannot predict the long-term prognosis of patients with pulmonary sarcoidosis by using these new tests, nor can we differentiate from the entire group of patients those with the more progressive forms of the disease, about 30 percent of all cases, who are at greater risk to develop pulmonary fibrosis.5,9,10,13 It also appears that serum angiotensin-converting enzyme, bronchoalveolar lavage, and gallium 67 lung