

be advisable to hyperaliment your cardiac cachectic patient prior to an elective procedure, since cachexia may cause defects in the immune response mechanism.

There are several rather simple clues by which you can identify the cardiac cachectic. Many of these patients have albumin deficits and lymphopenia. They are anergic and do not respond to skin testing with tuberculin or *Candida albicans*. If a patient doesn't react to these antigens, it can be assumed his host defenses have been severely compromised.

Anthropometric measurements such as comparing height/weight ratios, arm circumference, or triceps skin fold to established norms can also aid in the identification of these depleted patients.

If the cardiac cachectic is relatively stable, you can afford the luxury of a few weeks of oral or parenteral hyperalimentation prior to surgery. Ideally, one attempts to provide 40 calories and 1.7 grams of protein per kilogram of optimal body weight per day. It is remarkable how well the majority of these patients respond to hyperalimentation. The change from a negative to positive protein balance and adequate caloric intake literally reignites their interest in living. These patients stop being argumentative, paranoid and lethargic.

Preliminary data on one group of patients undergoing multivalve replacement suggest that mortality and morbidity decrease significantly if the patient is properly nourished pre- and postoperatively. Ongoing investigation of this link in many cardiac syndromes will hopefully buttress this observation.

Hyperalimentation is especially useful — even life-saving — in the interim between a major cardiac procedure and elective or semi-elective surgery. Building the post cardiac surgery patient back up to near normal body weight and positive protein balance is imperative before attempting lesser procedures.

Sedation

Cardiac patients are probably the most apprehensive of all. There is a tendency on the part of physicians to combat this fear and its potential cardiovascular ramifications with heavy preop sedation. But this can cause hypoventilation and CO₂ retention, which is much worse for these patients than the anxiety the sedation was supposed to relieve in the first place.

I recommend that the cardiac patient be transported from his room to the OR with oxygen running. If he has angina and nitroglycerin has been effective in controlling it, let him take nitroglycerin before leaving his room and let him carry his bottle of

nitroglycerin with him. This can be tremendously reassuring, as well as being therapeutic.

Use preoperative sedatives judiciously. One can always give more sedation, but you can't diminish a heavy dose once it has been administered.

Induction

Certain anesthetic techniques are contraindicated in cardiac patients. It behooves the primary physician, if he is to be a member of the surgical team, and the surgeon to discuss the anesthetic technique with the anesthesiologist well before the operation.

It is well known that certain inhalational agents such as halothane sensitize the myocardium and can precipitate arrhythmias. Hence an anesthetic technique for known cardiacs that seems to be gaining acceptance is I.V. morphine, nitrous oxide, and high-flow oxygen. Though the nitrous oxide does have some cardiodepressive action, this combination seems to present minimal hazards to the diseased myocardium.

Whatever technique the anesthesiologist decides to use, a calm, sedate induction with pre-oxygenation is certainly to be desired. Too often, the surgical team forgets that the general commotion in the OR becomes amplified for the patient during induction. Soft noises seem to be very loud and disconcerting. There should be no talk and minimal background noise until the patient's level of consciousness descends below the auditory level.

There is one exception to the edict against talking. We should never forget how terribly frightened these cardiac patients are immediately prior to surgery. It is important to stand by them — perhaps pat them on the shoulder — or talk softly to them before they go to sleep. If the primary physician is to be a member of the operative team, he can make a key contribution simply by being near his patient during induction. Seeing a familiar face can make all the difference.

Intraoperative Monitoring

The basic minimal monitoring of a cardiac patient during surgery should include continuous ECG and measurements of arterial and central venous pressures, and urine output. The Swan-Ganz catheter is indicated in the unstable cardiac undergoing surgery. It can be used to measure not only right- but left-sided pressures during surgery and postoperatively. However, since the use of the Swan-Ganz has been associated with certain complications and morbidity, its routine use is not recommended, and when used, the technique should be supervised by someone thoroughly familiar with it.

A gross but helpful assessment of cardiac output is urine output. Low cardiac output will result in in-