sessions covering ultrasound principles, image acquisition and processing, and data interpretation. The intensivists attended regular weekly review sessions of echocardiograms, and were then taught the performance of TEE examination under the direct supervision of cardiologists. As their level of competence rose, the intensivists graduated to the un-supervised level. This occurred after completing the basic educational program and 8 to 10 procedures under direct supervision by the cardiologist. The study looked at the independent performance of limited goal-directed TEE examination by intensivists after this training program. The intensivists’ findings in this study were confirmed by the cardiologists’ findings in 93% of cases assessed for LV wall thickness, 87% of intracardiac volume status, 81% for focal LV wall motion, and 77% for global LV contractility. There was no data collected on the clinical significance of the differences in findings between the intensivists’ and the cardiologists. In fact, this same study found that the PAC data significantly disagreed with TEE data, potentially changing appropriate treatment strategies.11

TTE and TEE are powerful tools. Miniaturized, handheld devices are now available to clinicians, and wider application of echocardiography may be forthcoming. The choice of which modality to apply is based on clinical scenario, ease of access, potential contraindications to invasive echocardiography with current probes, and availability of equipment, technicians, and physicians skilled in the use of echocardiography. The future availability of more sophisticated interrogation devices, such as advanced handheld devices, miniaturized transesophageal, or contoured surface probes that can be left in place for a continuous monitor, may make echocardiography dramatically more available. The study by Bossone and colleagues opens our eyes to the surprising incidence of significant pathology that may or may not have remained undetected. Further studies are needed to show the benefit of echocardiography on outcome, the potential misapplication or misinterpretation of findings, and the use of additional unnecessary and potentially dangerous interventions for insignificant findings.

References


Therapeutic Whole Lung Lavage

A Stop-Gap Therapy for Alveolar Proteinosis

Pulmonary alveolar proteinosis (PAP) is characterized clinically by nonresolving pulmonary infiltrates and hypoxemia in patients in their third and fourth decades, and it occurs with a male predominance. This disease is quite remarkable for flooding of the alveoli with lipoproteinaceous material, yet with minimal local lung inflammation or distortion of architecture on biopsy, for reasons that are unknown. The last 8 years have seen some remarkable advances into the pathophysiology of this disease, through transgenic murine models that have clearly established that hematopoietic growth factor (granulocyte-macrophage colony stimulating factor [GM-CSF]) is critical for local regulation of surfactant...
homeostasis. Additional human studies have clearly linked the presence of a circulating, neutralizing anti-GM-CSF antibody in adults with idiopathic PAP.\(^1,2\)

Therefore, in the current paradigm, there are three major clinical subtypes of PAP: the most common adult idiopathic variety, which is presumably autoimmune (with a circulating anti–GM-CSF antibody); a neonatal variety that is likely due to a defect in surfactant proteins B or C or the common β-chain of the GM-CSF receptor; and secondary PAP associated with occupational exposures or immunologic disorders.

To date, there have been no reports of the presence of an antibody in the neonatal variety. Preliminary reports from several groups indicate that a subset of adult patients with idiopathic PAP respond favorably to GM-CSF therapy.\(^3,4\)

The current standard therapy for PAP, which fits the initial description by Ramirez-Rivera et al.\(^5\) is therapeutic whole-lung lavage (either one lung per session or two sequential whole-lung lavages under one anesthesia session) in the operating room under general anesthesia using a double-lumen endotracheal tube. Although physical removal of the lipoproteinaceous material through repeated dilution with saline solution is believed to be the mechanism for the beneficial effects of whole-lung lavage, additional mechanisms—including the bulk removal of anti–GM-CSF antibody as well as other possible immunologic effects on the effector cells, such as the alveolar macrophage or the type II epithelial cell—are possible.

The “intentional drowning” or therapeutic whole-lung lavage clinically has improved the quality of life as well as the survival of patients over the last 4 decades. However, the procedure is technically difficult and usually requires an anesthesiologist with expertise in placement of double-lumen endotracheal tubes and the isolation of the two lungs almost always under general anesthesia in the operating room setting. Many aspects of the natural history of PAP are quite variable, including the severity of the disease as well as the need for recurrent lavage. In this context, a less cumbersome procedure for carefully selected patients is a welcome addition. Lobar therapeutic lavage performed through fiberoptic bronchoscopy over several outpatient sessions sequentially may have appeal in milder disease or in severe disease, where the physiologic derangement of whole-lung lavage, especially during the drainage phase, is not tolerated.

Cheng and colleagues in this issue of CHEST (see page 1480) extended the technique of fiberoptic lobar therapeutic lavage to three adult PAP patients and have demonstrated convincing improvement in oxygenation after multiple lavages. We must await further narrative studies regarding relative efficacy of multiple lobar fiberoptic lavages vs whole-lung lavage with lung isolation. Pending more definitive approaches to manipulate the GM-CSF and anti–GM-CSF antibody balance, therapeutic lung lavage (either bronchoscopic lobar or whole lung) represents an effective symptomatic stopgap therapy for very severely affected patients.

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