salva maneuver with \[4\] inactivity after drug abuse) and (5) restrictive (interstitial disease due to drug abuse or \(P\) \textit{carinii} pneumonia) SP-promoting factors.

Decreased pulmonary perfusion in the acute phase of SP has been found\[^{44-66}\] and attributed to obstruction.\[^{67}\] In a study of the regional lung function of nonsmokers with healed SP,\[^{68}\] the pulmonary perfusion was found to be decreased to the same extent bilaterally in the apical regions but increased in the SP-affected side in the basal region. The ventilation deteriorated and the washout half time was delayed, indicating airflow limitation, especially on the affected side in the apical region. Bronchial airflow may be affected by a check valve mechanism\[^{11,25,39,44,49,51,55-63}\] in the distal part of the airways.

Deteriorated ventilation and perfusion may contribute to an increasing pressure difference between the closed intrapulmonary region and the intrapleural space. Pressure equilibration is delayed, especially at decreasing ambient pressure, resulting in rupture of the pulmonary tissue and development of cavities (bullae or blebs), mostly in the apical region on the SP-affected side.\[^{5,27,30,50,60,69-71}\] Further growth and rupture of cavities into the intrapleural space causes SP.

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References are available from the author upon request. The superscript notations of reference citations have been retained to assist readers who request the reference list.

In Search of a More Comfortable Thoracotomy

Posterolateral thoracotomy, compared to many other operative approaches, produces a considerable amount of postoperative pain. This pain often leads to adverse effects on breathing mechanics and patient recovery. Any successful intervention that lessens postoperative pain has the potential for producing favorable physiologic effects as well as a grateful, relatively comfortable patient. Simple human compassion would seem to make the latter effect as important as the former.

More than ten years ago my colleagues and I described a technique for intercostal nerve block after thoracotomy.\[^{1}\] That technique involved the intraoperative placement of five small catheters led into the wound percutaneously with their tips secured by sutures in the intercostal neurovascular bundles. Over a period of time using the technique in private practice, I found myself somewhat dissatisfied because of the rather cumbersome procedure required for catheter placement and a somewhat less than uniform and predictable result in terms of pain relief.

In the article by Majid and Hamzah in this issue (see page 981), the authors describe and evaluate an alternative technique for supplying local anesthetic to the intercostal nerves. The technique of placing a single catheter in an "extrapleural tunnel" would seem to have some advantage in terms of simplicity. On the other hand, I would expect a considerable amount of difficulty with establishing well-sealed tunnels with a resulting variability in efficacy. The authors allude to some patients with known tears in their thin pleural membranes. I would anticipate that problem recurring with annoying regularity, considering the delicacy of the structure involved.

Because of my dissatisfaction with my original mult catheter technique, I became interested in trying the alternative of intercostal nerve freezing by intraoperative application of a cryoprobe. Clinical results were also somewhat less than uniformly predictable. More importantly, longer term follow-up revealed a disturbing number of patients who developed chest wall pain months after the procedure. This unacceptable outcome caused me to abandon the cryolesion technique as soon as the phenomenon began to surface.

The use of patient-controlled analgesia (PCA) pumps that administer intravenous narcotics on patient demand (within appropriate safety limits) has, in general, been a step forward in achieving the goal of a relatively comfortable patient. It does lack, however, most of the potential physiologic benefits of intercostal nerve blockade.

More recently, my enthusiasm in this area has been rekindled by the application of continuous infusion of fentanyl or intermittent infusion of morphine through epidural catheters in the post-thoracotomy period. The epidural catheter can be positioned in the operating room either prior to or following the thoracotomy, depending on the preferences of the surgeon and the anesthesiologist. Patient satisfaction and physiologic benefit appear good. The catheter system and its placement technique are relatively simple. Postoperative maintenance and monitoring of the system requires more time commitment from the Anesthesiology Department. Overall, the epidural analgesia technique seems to offer a more nearly ideal approach to the problem of post-thoracotomy pain management.

Although the technique offered by Majid and Hamzah is a potentially important refinement in the technology of intercostal nerve blockade, I expect continuing loss of interest in that approach because of the increasing use of epidural techniques.

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REFERENCE