Effective analgesia and blockade of the perioperative stress response may improve outcome and accelerate recovery following thoracic surgery. Although different approaches can achieve the same goal, it seems that a multimodal pain management based on the use of synergistic drugs provides better analgesia. The route of administration of the postoperative analgesic drugs is important, and epidural analgesia plays a role in the reduction of pulmonary complications.

(CHEST 1999; 115:122S–124S)

A proper pain management plan is essential after thoracic surgery. The reason is not only the intense pain but also because an ineffective pain control may lead to serious pulmonary complications. There is also some evidence that poor perioperative pain management may contribute to chronic postthoracotomy pain syndrome.1-2

It is interesting to note that postoperative pain management is affected by choices made in the preoperative and intraoperative periods. A well-prepared patient, knowing what to expect in the postoperative period, will require less analgesic than patients receiving no information about the postoperative course.3

Intraoperatively, the anesthetic technique itself, general anesthesia with or without opioid vs the use of regional techniques, will influence the analgesic requirements in the postoperative period.4 Under regional anesthesia, the cord receives no afferent input from the surgical stimulus. Local anesthetics will block the volley of nerve impulses in the unmyelinated C fibers and prevent prolonged widespread increase in reflex excitability in the spinal cord dorsal horn. This is known as the “wind up” phenomenon or central sensitization.5 Even large doses of opioids alone will not be able to prevent this phenomenon once established will not be able to counteract it effectively.6

In the postoperative period, there are several options for pain control. It is important, however, that pain control is initiated early in the postoperative period. This is not only to provide comfort, but also to win patient’s confidence in the medical providers, thus reducing the feeling of anxiety and helplessness, so harmful to further effective pain management. As explained above, early pain control would also avoid the “wind up” phenomenon and central sensitization.

Methods for Postthoracotomy Pain Management

The options for pain management include the following:

1. Systemic analgesics
2. Neuraxial opioids and local anesthetics
   a. Epidural route
   b. Intrathecal route
3. Regional anesthetic techniques
   a. Intercostal nerve blocks and catheters
   b. Interpleural catheters
   c. Paravertebral nerve blocks and catheters
4. Adjuvant treatments like transcutaneous electrical nerve stimulation (TENS) unit, heat application, etc

A large survey examining pain management after thoracotomy in 27 Australian hospitals showed that the most frequently used analgesic modalities are epidural analgesia, IV patient-controlled analgesia (PCA), and nurse-controlled IV opioid infusions. Respondents reported that cryoanalgesia, interpleural blockade, paravertebral blockade, subarachnoid infusions, ketamine, and TENS are used infrequently. Seventy-nine percent of respondents selected epidural analgesia as the best available analgesia technique, whereas 21% consider IV PCA to be the best.7

Systemic Analgesics

Opioids remain the mainstay of postoperative analgesia and have demonstrated their efficacy in the
management of severe pain. The main concerns about the use of opioids remain their side effects: nausea, vomiting, ileus, biliary spasms, respiratory depression, and the potential for abuse, although in the immediate postoperative period, this is rarely an issue. Opioids can be administered IM, subcutaneously, or IV.

A very efficient method of delivery of opioids is via PCA devices. Numerous studies have demonstrated the safety and opioid-sparing effect of PCA.

With opioids alone, IM or IV, the analgesia may be marginal and side effects intolerable (nausea, vomiting, sedation), thus the need for synergy, choosing drug classes that will overlap for analgesia but not for side effects. Drug classes that fit these requirements are as follows: mu agonist opioids, cyclooxygenase inhibitors, α2-agonists, nitric oxide synthetase inhibitors, N-methyl-D-aspartate receptor blockers, and local anesthetics when delivered by thoracic epidural catheters. This balanced analgesia or delivery of different classes of analgesics will result in effective pain relief by synergistic or additive effect with reduced incidence of side effects.

Nonsteroidal anti-inflammatory agents produce their effect by inhibiting the prostaglandin synthesis and release at the level of cyclooxygenase. These drugs have proven efficacy as the sole analgesic agent for management of mild-to-moderate pain in minor surgical procedures.8

Neuraxial Opioids and Local Anesthetics

This can be provided via epidural or intrathecal route. Of these, epidural catheter infusion is the most commonly employed method and recently, a cumulative meta-analysis of various postoperative analgesic therapies shows that epidural opioids and epidural local anesthetics with or without opioids decreased the incidence of pulmonary complications as compared with systemic opioids.9 The amount of opioids needed by neuraxial route (especially when combined with local anesthetics) is less than that by systemic route, and thus the systemic side effects of opioids may be less frequent.10 In the Australian survey7 when epidural analgesia was used, most respondents placed the catheter in the midthoracic region (91%), used a regimen of opioids plus local anesthetic (96%), used a constant infusion technique (100%), and continued analgesia for up to 3 days (83%).

A single intrathecal opioid injection can also be used either alone or in combination with epidural infusion and other methods for pain control. However, the pain relief achieved with this method usually is not longer than 12 to 16 h, and the need for monitoring for possible respiratory depression is the same as for epidural opioids administration.

The relative contraindications for neuraxial interventions include coagulopathy, both intrinsic and idiopathic, infection at the local puncture area, and sepsis. The overall incidence of complications after thoracic epidural catheterization is low. In a large study of 4,185 patients, the complication rate was 3.1% (n = 128). This included dural perforation (0.7%; n = 30), unsuccessful catheter placement (1.1%; n = 45), postoperative radicular-type pain (0.2%; n = 9), responsive to catheter withdrawal in all cases, and peripheral nerve lesions (0.6%; n = 24), 0.3% (n = 14) of which were peroneal nerve palsies probably related to surgical positioning or other transient peripheral nerve lesions (0.2%; n = 10). No signs suggesting epidural hematoma were recognized, and there were no permanent sensory or motor defects attributable to epidural catheterization. A single patient experienced severe respiratory depression after receiving epidural buprenorphine but recovered without sequelae.11

It should also be noted that a combination of systemic opioid (preferably IV PCA mode) and neuraxial (preferably epidural) local anesthetic with or without opioid may provide a very effective mode of pain control.

Regional Anesthetic Techniques

Regional anesthetic techniques include different methods of blocking intercostal nerves as well as intrapleural catheter infusion.

Intercostal nerve blocks can be performed either intraoperatively or postoperatively. They have provided good relief lasting 6 to 12 h and need to be repeated. A longer-lasting relief can be obtained by an extrapleural catheter placed next to intercostal nerves. An infusion of local anesthetics through this catheter has worked effectively for pain relief.12,13 Also, good results have been obtained with cryoablation of intercostal nerves intraoperatively for a longer-lasting relief.14

An alternate route is the administration of local anesthetic through an interpleural catheter. This is done by placing a catheter between the parietal and visceral pleura and running the infusion either intermittently or continuously.15 One of the problems is the loss of the local anesthetic solution through the chest tubes or the need to clamp these tubes intermittently for this technique to be effective.

Paravertebral neuronal blockade has been performed both by multiple injections and catheters for postthoracotomy pain control with good results.16
Adjuvant Methods

The use of adjuvant methods like TENS, heat and cold application, music therapy, and relaxation techniques have also been useful in acute postoperative pain settings.17,18 Other factors may contribute an improved outcome following thoracic surgery, and these include early mobilization, effective chest physical therapy, incentive spirometry, early feeding, all of which will be more efficient given good analgesia with minimal side effects (nausea, sedation, or orthostasis).19

Conclusions

In conclusion, there are a variety of methods available for postthoracotomy pain management. Epidural opioids with or without local anesthetics have been found useful in reducing the dose of IV opioids needed, and thus, reducing the systemic side effects of opioids. For IV opioids, PCA is a preferred mode and can be used in combination with epidural local anesthetics and opioids. When considering different pain management strategies for postoperative thoracotomy patients, one needs to consider personnel and equipment resources to support epidural analgesia and/or PCA at individual institutions.

As described above, there are some other techniques available for administration of local anesthetics or opioids which have not been used widely but can be effective in pain management. We cannot overemphasize the importance of adjuvant pain control methods and also the early initiation of an effective pain management strategy.

References