Video-assisted thoracoscopic surgery (VATS) was developed in the 1990s and since its introduction it has gradually become the standard of care for the resection of early stage lung cancer (1). In 2009 according the Society of Thoracic Surgeons (STS) database, in the US, approximately 45% of lobectomies were done with VATS approach (2). VATS is minimally invasive, as it does not require rib cutting or spreading and it is associated with less mortality and morbidity when compared to open thoracotomies. Even the largest ‘utility’ VATS incision is very small only 4 to 6 cm long within the 3rd or 4th intercostal space. The average length of hospital stay after VATS lobectomy is reduced to 3 or 4 days (vs. 4 to 5 days after open lobectomy).

Thoracic epidural (TEA) is the gold standard of pain management after open thoracotomy. It is a very safe and common procedure but it is not without complications. Giebler et al. retrospectively and prospectively analyzed 4185 thoracic epidural catheterizations and found an overall complication rate of 3.1% which included failed placement, dural puncture, radicular pain and nerve damage (3). Interestingly in other studies thoracic epidural use was never shown to improve mortality or decreasing chronic pain after thoracic surgery (4). The most common side effect of thoracic epidural use that the clinicians encounter is postoperative hypotension. It is reported to have an incidence of 8 to 14% (5), but in clinical practice in the fluid restricted thoracic patient, it is even higher and often limits effective postoperative epidural use (or forces the clinician to give additional fluid boluses or to use a vasopressor).

Very few studies have investigated what the optimal analgesic control is after VATS lobectomy. Our analgesic armory includes IV narcotics, multimodal analgesia, intercostal, paravertebral block and of course thoracic epidural.

Two small studies have looked at the need of thoracic epidural for VATS lobectomy. The first one by Yoshioka et al from Japan enrolled 46 patients scheduled for elective VATS lobectomy (6). Patients were prospectively randomized into an epidural group receiving 0.25% bupivacaine and fentanyl versus non-TEA group. The non-epidural group received only PRN rectal NSAID diclofenac and an intramuscular opioid agonist-antagonist pentazocine. Interestingly neither group received any IV narcotic during or after surgery (not even the non-TEA group)! The size of the utility port incision was 6 mm. Pain scores at rest and during activity were evaluated along with total rectal diclofenac and IM pentazocine use. Not surprisingly the non-TEA group received significantly more PRN medication, however surprisingly from postoperative day 1 there was no difference between the mean visual analogue scale (VAS) scores between the 2 groups. The author’s recommendation was that TEA is recommended only until postoperative day one (POD 1). They have also found that 29% of the TEA patients were affected by significant nausea and vomiting. Off note the absolute mean VAS scores in the non-TEA group was around 4 mm and decreased to 2 mm by POD 2. The conclusion of this study that even though the non-TEA group received no surgical analgesia TEA
only provided and analgesic benefit for one day, until the IM and rectal pain medications took effect.

The second prospective randomized study came from Korea by Kim et al, and was published in 2009 (vs. Yoshioka 2006) (7). They enrolled 37 VATS lobectomy patients and randomized them into a thoracic epidural (TEA) group (receiving 0.2% ropivacaine + fentanyl) versus IVPCA (ketorolac + fentanyl). Both TEA and IVPCA arm utilized a baseline continuous infusion plus patient controlled boluses. Additional PRN IV morphine was prescribed for breakthrough pain for both groups. The total morphine consumption was recorded. The authors have found no difference in morphine use, VAS score at rest or movement, or in FVC and FeV1 changes when compared to preoperative values. The conclusion of this study was that multimodal IV analgesia provides sufficient pain control for VATS lobectomy, making TEA unnecessary. Interestingly the overall VAS pain scores were very similar to the Yoshioka study, 4 mm after surgery and about 2 mm by POD 2.

Now lets look at what other analgesic options are available and whether they can be more effective than multimodal IV analgesia. First paravertebral block (PVB), which is enjoying its newfound renaissance. The advantages of PVB compared to TEA, that it is easier to place, have a high success rate and have significantly less side effects including hypotension, pruritus, urinary retention. PVB de facto provides some degree of epidural analgesia with spinal nerve root and nerve blockade. For a procedure like VATS lobectomy, which only needs one or a maximum of two days of pain control it could be the perfect analgesic option. Along these lines Hill et al. from Duke have designed a prospective double blinded randomized clinical trial, and compared the effects of 6 paravertebral injections of 0.5% bupivacaine versus placebo in 80 adult patients (8). The type of surgical procedure was described as no more invasive than VATS lobectomy, so it maybe safe to assume most of the cases studied were actually VATS lobectomies. Their main outcomes were postoperative VAS score and morphine consumption, which was given through an IV PCA. They have found that PVB has only provided a 31% reduction in morphine use and only for 6 hours postoperatively. This was associated with the modest findings of less pain score variability and lower maximum pain score. But importantly there was no difference in morphine PCA use at 12 or 18 hours, which is very surprising as 0.5% bupivacaine from our regional anesthetic experience, should work for such time period (12-15 hours). The findings could be explained that IV morphine PCA has provided an analgesic equivalent pain control to PVB by 6 hours (31% more morphine load). There was also no significant difference in median VAS scores at any time points (not even at 6 hours), and no difference in any VAS scores beyond 12 and 18 hours. Overall VAS scores were very similar to the previous Japanese and Korean study, about 4.7 mm immediately postoperatively which decreased to 2 mm by the end of day one. Again the same results as in the previous TEA studies, marginally no added effectiveness of PVB regional anesthesia compared to IV analgesia. Now finally lets look at a multimodal approach from Denmark Copenhagen by Wildgaard et al. from 2012 (9). They designed a prospective observational study and enrolled 48 (completed enrollment) patients scheduled for elective lobectomy. Their utility incision was 4 to 5 cm as part of the standard three-port technique. Each enrolled patient received
preoperatively a combination of paracetamol (nor-acetaminophen), ibuprofen and gabapentin, in addition to 0.5% bupivacaine PVB at T3 to T8 level, plus an intercostal catheter with a continuous infusion of 0.25% bupivacaine at the chest tube site. The patients also received 10 mg IV morphine before extubation. This study did not have a comparative arm; their outcome was overall pain control. Not surprisingly they had good analgesic outcomes, with very low overall VAS pain scores, around 3 mm, at the conclusion of surgery and down to less than 2 mm before postoperative day one.

The conclusion is that thoracic epidural is not necessary for minimally invasive VATS lobectomy. Multimodal IV anesthesia, with a combination of intraoperative spinal nerve block, NSAID, acetaminophen and an opioid, is perfectly sufficiently to control postoperative pain and still allows for early mobilization and discharge. TEA however should be still offered to opioid tolerant patients or when there is a high chance for converting the thoracoscopic procedure to open thoracotomy.

References


