Thoracotomy: Gain With Less Pain?

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Proof of clinical effectiveness ranges from simple to extremely complex. Relieving tension pneumothorax needs only observation: the hiss of escaping air is accompanied by evident clinical improvement, incontrovertibly linking intervention and benefit. At the difficult end is prevention of postoperative pain. A mix of aetiologies, patient subjectivity, observer biases, and the competing effects of therapeutic strategies make it difficult to be sure of the effect of any 1 component. A randomised controlled trial (RCT) with blinding of patients and observers is the best way to be sure. RCTs have called a halt to many treatments shown to not benefit patients,[1] but they are an exacting discipline. Krishnamoorthy et al[2] call for further research (as authors often do), but a lot is known already and some of remaining uncertainties are amenable to observational study.[3]

What is the cause of shoulder pain after thoracotomy? Trials are the most reliable way to test treatments but original discoveries are often chance observations.[5] Shoulder pain may be attributable to the position imposed on the anaesthetised patient. In the 1970s, my mentors took great care in positioning their patients but I noted that some patients after median sternotomy had numbness in the hand, attributed to ulnar nerve pressure. On examination, the sensory loss was in C8/T1 sensory distribution pointing to a brachial plexus lesion. In a study in 200 subsequent patients, denervation potentials were found in chest wall muscles.[4] With changes in securing the arms and the extent of sternal retraction, the problem resolved. In positioning patients for muscle-sparing[6] and video-assisted surgery, the shoulder may pay a penalty.

Referred pain from the diaphragm is the other candidate. Received wisdom casts suspicion on the basal drain. That cause should have been eliminated by protocol in Krishnamoorthy's study. 'A size 28 Fg chest tube was placed as an apical drain according to our local surgeon's practice'.[2] Perhaps the position of the apostrophe provides a clue; pleural drainage is influenced by surgeons' preference[7] and there may have been deviations from protocol. The investigators could review the radiographs to check the position of all drains. Pain data, collected blind to intervention, are already on record. Brought together for independent and unbiased analysis, an association could be tested. Verification of protocol adherence is a useful component of RCTs. In a randomised trial of stopping or continuing aspirin before coronary surgery, blood and urine samples showed 99% compliance providing mechanistic verification of the empirical findings of the RCT.[8]

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Central Message

RCTs test whether useful net benefit can be detected amongst the 'noise' to make it worth adding yet another intervention.

The authors state that diaphragmatic paralysis due to phrenic nerve block 'has not yet been proven'.[2] It clearly has been proven. A PubMed search for ([phrenic nerve block]) OR [phrenic nerve infiltration]) AND ([diaphragm*] AND [paralysis]) found 12 papers, mainly reporting inadvertent paralysis of the diaphragm with brachial plexus block. Furthermore, there is evidence of reduced lung function.[9–11] This effect has been used to reversibly manage the residual pleural space after lung resections.[12] Blocking the phrenic nerve is a precise localised intervention and it is possible to get a long way in reducing unknowns by observation. No dentist or dental patient is in doubt about the efficacy of a nerve block and that didn't require an RCT.

The decrease in the incidence and severity of shoulder pain with nerve block supports the role of the phrenic nerve in its

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transmission.[11,13–16] It is interesting to me that shoulder pain seems to have re-emerged as a problem. The anaesthesiologist Nigel Scrawn has contributed so much to reducing patients' suffering[13–15] and he tells me that shoulder pain appeared as a thoracotomy plus epidural phenomenon. It was only noticed by the patients if the epidural was effective and providing good analgesia to the chest wall. If the patients had incision pain, they rarely complained of shoulder pain. If the epidural worked well, and shoulder pain was avoided by phrenic nerve block, patients became aware of pain from their IVs.

Reduction in breathing capacity may be a consequence. It was unlucky that there was imbalance in patients' breathing capacity preoperatively making change difficult to evaluate. A way to avoid imbalance would have been to minimise differences in known confounders between study arms.[17] Unless minimisation is done independently and out of sight of the investigators, it introduces a risk of manipulation of treatment assignment but with those safeguards it saves troublesome imbalance which can undermine a trial.

The phrase 'real world data' is increasingly used in justification of doctors' unwillingness to do proper trials.[18] I disagree: trials should and do reflect *reality* as illustrated by this trial with all its interaction, confounders, and uncertainties. RCTs test whether useful net benefit is detectable amongst the 'noise' making it worth adding yet another intervention. That is the real-world question in clinical practice which is most reliably answered by RCTs.

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