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Combined paravertebral and intrathecal *vs* thoracic epidural analgesia for post-thoracotomy pain relief

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Editor's key points

- This study compared thoracic epidural analgesia (TEA) and a combined thoracic paravertebral block (PVB) and intrathecal opioid (ITO) administration for post-thoracotomy pain relief.
- Only small difference in the quality of pain relief was found between both therapies.
- Combined PVB and ITO might be an accurate alternative to TEA.

Background. Although thoracic epidural analgesia (TEA) is considered the gold standard for post-thoracotomy pain relief, thoracic paravertebral block (PVB) and intrathecal opioid (ITO) administration have also been shown to be efficacious. We hypothesized that the combination of PVB and ITO provides analgesia comparable with that of TEA.

Methods. After local ethics committee approval, 84 consecutive patients undergoing open thoracic procedures were randomized to the TEA (ropivacaine 0.2%+sufentanil) or the PVB (ropivacaine 0.5%)+ITO (sufentanil+morphine) group. The primary endpoints were pain intensities at rest and during coughing/movement at 1, 2, 4, 8, 12, 24, 48, and 72 h after operation assessed by visual analogue scale (VAS) score. Data were analysed by multivariate analysis (ANOVA; $P<0.05$).

Results. Patient and surgical characteristics were comparable between the groups. The mean and maximal VAS scores were lower in the TEA ($n=43$) than in the PVB+ITO group ($n=37$) at several time points at rest ($P<0.026$) and during coughing/movement ($P<0.021$). However, in the PVB+ITO group, the mean VAS scores never exceeded 1.9 and 3.5 at rest and during coughing/movement, respectively; and the maximal differences between the groups (TEA *vs* PVB+ITO) in the maximal VAS scores were only 1.2 (3.4 *vs* 4.6) at rest, and 1.3 (4.4 *vs* 5.7) during coughing/movement.

Conclusions. Although VAS scores were statistically lower in the TEA compared with the PVB+ITO group at some observation points, the differences were small and of questionable clinical relevance. Thus, combined PVB and ITO can be considered a satisfactory alternative to TEA for post-thoracotomy pain relief.

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Post-thoracotomy pain is frequent and associated with considerable complications.[1 2] Severe postoperative pain, in general, impairs postoperative patient mobilization, increases perioperative morbidity, and may trigger a chronic pain syndrome.[3–5] Post-thoracotomy pain, in particular, will adversely affect pulmonary function by impairing deep breathing and effective coughing, resulting in retention of secretions, atelectasis, and pneumonia.[6]

Various regional techniques (e.g. intercostal, paravertebral, interpleural, and epidural blocks with local anaesthetics and opioids) have been used to provide pain relief after thoracotomy. Thoracic epidural anaesthesia (TEA) has emerged as the gold standard for post-thoracotomy pain control.[7] However, this method is not suitable for all patients and is associated with numerous risks (e.g. dural perforation, spinal cord damage by formation of haematoma, infection and abscess; hypotension; urinary retention).[8] Thoracic paravertebral nerve block (PVB) produces unilateral analgesia over several thoracic segments and has been shown to provide effective post-thoracotomy pain control.[7 9–13] PVB was as effective as TEA in controlling post-thoracotomy pain and associated with less haemodynamic side-effects.[12 13]

Single injection of an opioid into the subarachnoid space is a long-established but infrequently used analgesic technique in thoracic surgery.[14–16] Both sufentanil and morphine have been used for this purpose.[17] Related to their different lipid

solubility, intrathecal (IT) sufentanil has a rapid onset (peak effect <5 min after injection) and relatively short duration of action (~1 h), whereas IT morphine has delayed onset (peak effect 6–7 h after injection) and long duration (~24 h).[17 18] Thus, the combination of IT sufentanil and morphine provides rapid onset and long-lasting analgesia. Based on the various findings, we hypothesized that the combination of thoracic PVB with local anaesthetic and IT sufentanil and morphine would provide post-thoracotomy pain relief comparable with that of TEA with local anaesthetic and sufentanil.

Methods

The study was approved by the local ethics committee and registered (AZ: 35/07) (ClinicalTrials.gov number: NCT00493909). Inclusion criteria were age between 18 and 75 yr, and lung resection via open thoracotomy. Exclusion criteria were additional chest wall resection, emergency surgery, pregnancy, and contraindications to regional techniques (i.e. allergy to local anaesthetics, infection around the site of catheter insertion, evidence of systemic inflammation, coagulation disorder) (Fig. 1).

Patients were recruited between June 2007 and August 2008. After written informed consent had been obtained, patients were randomly allocated by computer-generated randomization to one of the following two groups: Group I: TEA with ropivacaine and sufentanil; Group II: combined thoracic PVB with ropivacaine and IT administration of opioids (ITO) sufentanil and morphine (PVB+ITO). Before operation, forced vital capacity (FVC), forced expiratory volume in 1 s (FEV1), and peak expiratory flow (PEF) were measured.

All patients were pre-medicated with midazolam (3.75–7.5 mg p.o.) shortly before transfer to the operating theatre area. All thoracic epidural and paravertebral catheters were placed by one of the two investigators (S.H., T.L.) in the anaesthetic pre-induction room before induction of anaesthesia. In patients randomized to the TEA group, an epidural catheter was placed in the sitting position at interspaces T4/5, T5/6, or T6/7 (depending on the site of surgery) via an 18 G Tuohy needle (Pajunk, Geisingen, Germany) using the midline approach and hanging drop technique. A test dose of 2 ml of mepivacaine 1% (20 mg) with epinephrine (10 μg) was administered through the catheter to rule out inadvertent IT or intravascular placement. Epidural analgesia was induced by slow injection of a total of 10 ml of

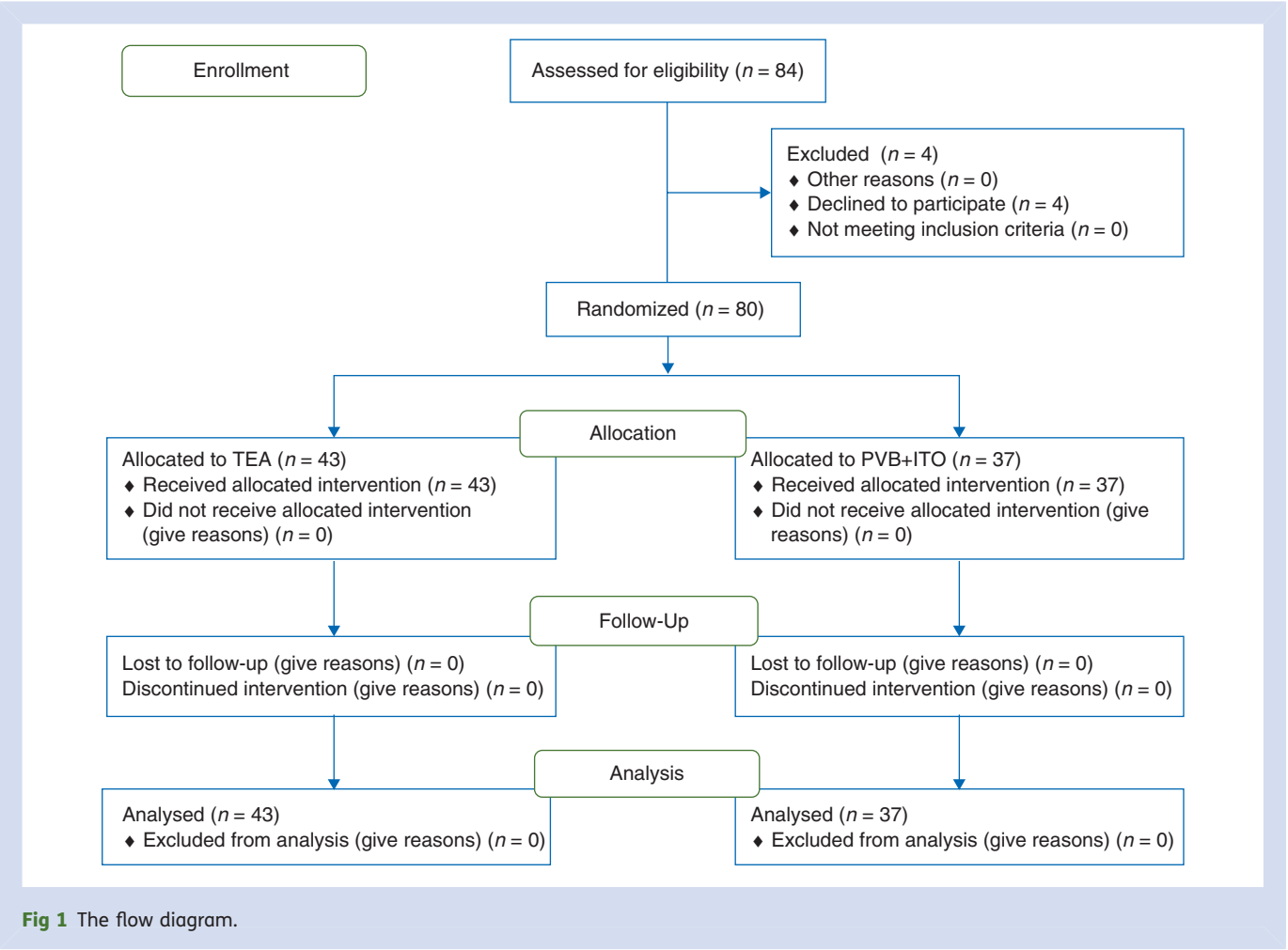

Fig 1 The flow diagram.