

Best evidence topic - Pulmonary

Should you place one or two chest drains in patients undergoing lobectomy?

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Received 17 February 2010; received in revised form 30 March 2010; accepted 13 April 2010

Summary

A best evidence topic in cardiac surgery was written according to a structured protocol. The question addressed was 'Should you place one or two chest drains in patients undergoing lobectomy?' Altogether >200 papers were found using the reported search, of which six represented the best evidence to answer the clinical question. The authors, journal, date and country of publication, patient group studied, study type, relevant outcomes and results of these papers are tabulated. We conclude that the insertion of one chest drain confers less postoperative pain as shown by one randomised controlled trial (RCT) and one further cohort study. In addition, another RCT was able to demonstrate a lower use of non-standard analgesia in the face of no overall difference in total pain score while another RCT conveyed a significantly shorter duration of opioid and NSAID use inferring less postoperative pain. From all the studies in this area, no differences in the duration and amount of drainage or the length of hospital stay could be demonstrated with any significance. Therefore, the use of the conventional two drain method is not superior to the one drain method and may indeed cause more pain and is obviously more expensive. © 2010 Published by European Association for Cardio-Thoracic Surgery. All rights reserved.

Keywords: Lobectomy; Chest drain; Chest tubes

1. Introduction

A best evidence topic was constructed according to a structured protocol. This is fully described in the ICVTS [1].

2. Three-part question

In [patients undergoing lobectomy] is [the conventional two drain method] superior [to the use of a single drain] in terms of [pain, cost and adequate drainage of the chest].

3. Clinical scenario

A week after you start your thoracic rotation in a new department, you come to appreciate that the consultant surgeon always inserts one chest drain instead of the conventional two drain method after major lung resections. When you ask the reasons behind this, he advocates that the postoperative pain experienced by the patient is less and that the duration of drainage hence length of hospital stay is shorter. He also adds that it is a less expensive method. With these reasons in mind, you resort to confirming this through the literature.

4. Search strategy

Medline 1950 to December 2009 using OVID interface. [Lobectomy.mp OR Lung resection\$.mp] AND [chest drain\$.mp OR exp Chest tubes/OR Chest Tube\$.mp]. The

reference lists of all selected papers were reviewed and any further papers of interest were also selected.

5. Search outcome

Two hundred and forty-three papers were found using the reported search. From these six papers were identified that provided the best evidence to answer the question. These are presented in Table 1.

6. Results

Alex et al. [2] in 2003 analysed 120 consecutive patients recruited between January 2001 and December 2002. Group A (60 patients) had two 28 French (F) drains inserted – one in the apical and the other in the basal position. Group B (60 patients) had a single 28F chest drain sited in the mid-position. Maximum pain scores were calculated every 15 min for the first hour, hourly for the next 12 h and every 4 h thereafter. There was a statistically significant difference in the maximum pain scores recorded between Group A and Group B patients (1.4 ± 0.8 vs. 1.02 ± 0.7 , respectively, $P=0.02$). Although there was a trend towards lower duration of drainage, total amount of drainage, duration of patient controlled analgesia or analgesic combinations, it was not statistically significant. The minimum cost saving in Group B was calculated to be equivalent to \$55 per patient translating to a total saving of US \$3300.

Gomez-Caro et al. [3] conducted a randomised controlled trial (RCT) with 119 patients. The patients were randomised

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Table 1. Best evidence papers

Author, date and country Study type (level of evidence)	Patient group	Outcomes	Key results	Comments
Alex et al., (2003), Ann Thorac Surg, UK, [2] Cohort study (level IIb)	One hundred and twenty consecutive patients were studied and divided into two groups: Group A (60 patients) had two 28F drains (Sherwood Medical, Gosport, UK) inserted and Group B (60 patients) had one 28F drain inserted	Maximum pain score Cost saving Length of stay Duration of drainage Amount of drainage	Group A mean: 1.4, S.D.: 0.8 Group B mean: 1.02, S.D.: 0.7 <i>P</i> =0.02 Minimum cost saving of \$3300 in Group B relative to Group A Group A mean: 7.7 days, S.D.: 3 days Group B mean: 7.8 days, S.D.: 3.2 days <i>P</i> =Not significant Group A mean: 4 days, S.D.: 3.2 days Group B mean: 4.3 days, S.D.: 3.3 days <i>P</i> =Not significant Group A mean: 667 ml; S.D.: 369 ml Group B mean: 804 ml; S.D.:498 ml <i>P</i> =Not significant	This study showed that compared to the conventional two-drain method, a single chest drain in the mid-position is significantly less painful, drains fluid and air effectively, reduces the number of radiological investigations thus significantly reducing the cost of treatment
Gomez-Caro et al., (2006), Eur J Cardiothorac Surg, Spain, [3] Randomised controlled trial (level Ib)	One hundred and nineteen patients were randomly assigned to receive either a single 28F drain (Sherwood Services AG, TYCO Healthcare, Ireland) (Group A: 60 patients) or two 28F drains (Group B: 59 patients)	Non-standard analgesia Pain score Length of stay Duration of drainage Amount of drainage Cost saving	Group A 1 patient (1.6%) Group B 9 patients (10.1%) <i>P</i> =0.0003 Group A mean: 2.3; S.D.: 1.2 Group B mean: 2.2; S.D.: 0.9 <i>P</i> ≥0.005 Group A mean: 4.70 days, S.D.: 4.4 days Group B mean: 4.96 days, S.D.: 0.9 days <i>P</i> =Not significant Group A mean: 4.2 days, S.D.: 1.3 days Group B mean: 4.4, S.D.: 0.9 days <i>P</i> =Not significant Group A mean: 923 ml; S.D.: 643 ml Group B mean: 890 ml; S.D.: 523 ml <i>P</i> =Not significant Amount of cost saving in Group A was mean: €212.67; S.D.: €7.60 compared to Group B	No significant differences between the use of one or two drains postlobectomy or bilobectomy in relationship to early postoperative outcome could be demonstrated. It can be concluded that the use of only one drain is more economical and likely to be less painful for patients without any additional adverse consequences
Icard et al., (2006), Eur J Cardiothorac Surg, France, [4] Case series (level IIb)	One hundred consecutive patients undergoing lobectomy were treated with a single 24F Blake drain (Ethicon, France)	Duration of drainage Length of stay	Median of 5 days (range 3–15 days) 90% of patients were discharged the day following chest drain removal. The remaining were awaiting further social care	One flexible single 24F Blake chest drain is an effective and safe method to drain air and fluid following standard thoracic surgery, such as lobectomies
Pawelczyk et al., (2007), Thorac Cardiovasc Surg, Poland, [5] Randomised controlled trial (level Ib)	One hundred and eighty- three consecutive patients undergoing lobectomy were randomised to receive two drains (93 patients) or one drain (90 patients)	Opioid use NSAID use Length of stay	Single drain: mean 4.8 days Two drains: mean 5.6 days <i>P</i> =0.0001 Single drain: mean 6.8 days Two drains: mean 7.7 days <i>P</i> =0.002 Single drain: mean 7.6 days Two drains: mean 9.0 days <i>P</i> =0.001	A single drain method is effective, reduces hospitalisation times and the cost of treatment in patients who undergo lobectomy

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Table 1. (Continued)

Author, date and country Study type (level of evidence)	Patient group	Outcomes	Key results	Comments
		Cost saving	Single drain saved ~€125 per patient	
Okur et al., (2009), Eur J Cardiothorac Surg, Turkey, [6]	One hundred consecutive patients undergoing lobectomy or bilobectomy were randomised to receive a single 32F polyethylene chest drain (Bicakcilar, Istanbul, Turkey) (Group 1) or two 32F polyethylene chest drains (Group 2)	Early postoperative pain	Group 1: mean 4.28; S.E. 0.21 Group 2: mean 5.10; S.E. 0.23 $P=0.014$	Insertion of two chest drains is not more effective than insertion of a single chest drain after standard pulmonary lobectomy. Moreover, using a single drain is more effective than using two drains in that it causes less postoperative pain and less pleural fluid loss without a change in the postoperative complication rate
Randomised controlled trial (level Ib)	Late postoperative pain	Group 1: mean 1.48; S.E. 0.13 Group 2: mean 2.00; S.E. 0.17 $P=0.01$		
	Amount of drainage	Group 1: mean 600 cc; S.E. 43.24 cc Group 2: mean 896 cc; S.E. 56.23 cc $P\leq 0.001$		
	Duration of drainage	Group 1: mean 3.38; S.D. 1.36 Group 2: mean 3.90; S.D. 1.46 $P=0.069$		
		Length of stay	Group 1: mean 4.84 days, S.D. 1.20 days Group 2: mean 5.20 days, S.D. 1.38 days $P=0.17$	
Kejriwal and Newman (2005), ANZ J Surg, Australia, [7]	Thirty seven patients undergoing various thoracic surgical procedures	Total drainage	420–5440 ml (mean 1387 ml)	Small single (19Fr) drain is safe and effective in draining both fluid and air after thoracotomy
Case series (level IIb)	Duration of tube in situ	Average 4.3 days (range 1–12 days)		
	Length of stay	Median 5 days (range 3–44 days)		

S.D., standard deviation; S.E., standard error; NSAID, non-steroidal anti-inflammatory drug.

to receive a single 28F drain sited laterally directed from the base towards the mid-cavity (Group A – 60 patients) or two 28F drains one sited apical and anterior, the other posterior and basal (Group B–59 patients). Despite no significant differences in the pain score registered, Group B patients necessitated significantly more intravenous morphine than patients in Group A [one patient (1.6%) vs. nine patients (10.1%), $P=0.0003$]. The cost saving in Group A patients was $\text{€}212.67 \pm \text{€}7.60$.

Icard et al. [4] prospectively evaluated 100 consecutive patients receiving a single 24F Blake drain. The drain was inserted and positioned at the apex for those patients undergoing upper lobectomy while the drain was positioned posteriorly and in front of paravertebral recess in those patients receiving a lower lobectomy. The median duration of drainage was five days (range: 3–15 days). The majority of patients (90%) were able to be discharged the day following chest drain removal. Furthermore, there were no increased rates of chest drain re-insertion in the post-operative period or four to six weeks following discharge.

A RCT conducted by Pawelczyk et al. [5] in 2007 studied 187 consecutive patients. Patients were randomised to receive a single drain (90 patients) or two drains (93 patients) sited in the mid-position. The study population with one drain in-situ demonstrated shorter periods of opioid (4.8 days vs. 5.6 days; $P=0.0001$) and non-steroidal

anti-inflammatory drug (NSAID) use (6.8 days vs. 7.7 days; $P=0.002$) relative to the patients with two drains inserted. This study was also able to convey that patients with one drain inserted had a shorter length of hospital stay relative to their counterparts with two drains (7.6 days vs. 9.0 days; $P=0.001$, respectively). The cost saving was calculated to be $\text{€}125.00$ per patient in the group with the single drain.

The recent RCT by Okur et al. [6] involved 100 consecutive patients from May 2006 to November 2007. Group 1 had a single 32F chest drain inserted in the mid-axillary line directed toward the apex; Group 2 had two 32F chest drains inserted in the mid-axillary line and the other in the anterior axillary line directed toward the apex. Patients in Group 1 experienced less pain both in the 'early' (4.28 ± 0.21 in Group 1 vs. 5.10 ± 0.23 in Group 2; $P=0.014$) and 'late' (1.48 ± 0.13 in Group 1 vs. 2.00 ± 0.17 in Group 2; $P=0.01$) postoperative periods. Although Group 1 patients showed a considerably lower amount of total pleural drainage than Group 2 patients (600 ± 43.24 cc vs. 896 ± 56.23 cc, respectively; $P < 0.001$), the need for additional drain insertion was similar in both groups. There was a trend towards decreased duration of pleural drainage and length of hospital stay in Group 1 patients but this was not statistically significant.

Kejriwal et al. [7] reported their experience of a single 19F silastic drain in 37 patients between November 2001

and November 2003. Total amount of drainage varied between 50 ml and 800 ml (mean 322 ml). Chest drains remained in place for an average of 4.3 days. None of the patients had residual pleural effusion. They concluded that the use of a small single silastic drain after thoracotomy may be safe and effective.

7. Clinical bottom line

The insertion of one chest drain confers less postoperative pain as shown by one RCT and one further cohort study. In addition, another RCT was able to demonstrate a lower use of non-standard analgesia in the face of no overall difference in total pain score while another RCT conveyed a significantly shorter duration of opioid and NSAID use inferring less postoperative pain. From all the studies in this area, no differences in the duration and amount of drainage or the lengths of hospital stay could be demonstrated with any significance. Therefore, the use of the conventional two drain method is not superior to one drain and may indeed cause more pain and is obviously more expensive.

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