

Thoracic Drains: One, Two or a Specially Designed Drain

Syed Mohiyaddin^{1*}, Ihab Ali², Arul Furtado³, Hoda Shokri⁴ and Mohammed Abd Al Jawad²

¹Morrison Hospital, Swansea, UK

²Associate Professor of Cardiothoracic Surgery, Ain-shams University, Egypt

³Associate Professor of Cardiac Surgery and Attending Surgeon, Apollo Hospital, Bangalore, India

⁴Associate Professor of Anaesthesiology, Ain-shams University, Egypt

***Corresponding Author:** Syed Mohiyaddin, Department of Cardiothoracic Surgery, Morrison Hospital, Swansea, UK..

Received: May 30, 2019; **Published:** June 19, 2019

Chest Physicians and Surgeons have long wondered whenever there is a patient needing an intercostal drainage system, we tend to ponder for a clinical solution. Do we go for a single and or a double drain insertion? Surgeons in conventional clinical practice generally tend to use two thoracic drains in post-operative lobectomy patients. However, some surgeons now advocate a single drain approach. Proponents of this practice cite a reduction in post-operative pain and reduced period of drainage. Both of these factors lead to a reduction in the length of hospital stay, therefore resulting in improved cost-effectiveness.

The aim of this project was to confirm this approach using the available literature.

Evidence

This work represents a best evidence topic in thoracic surgery. The clinical question addressed was whether one or two thoracic drains should be sited following lobectomy. Of > 200 available articles, 6 studies were identified which represented the best evidence on the topic. The authors of this study concluded:

- The insertion of one chest drain confers less postoperative pain as shown by one randomised controlled trial (RCT) and one further cohort study. This method resulted in reduced usage of non-standard analgesia. Furthermore, the duration of Opioid analgesia and NSAID therapy was shown to be significantly reduced.
- There is no statistically significant difference in the duration and amount of drainage or the length of hospital stay with a single thoracic drain.
- 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.

Based upon the results of this literature search and review of evidence, an improved thoracic drain was devised by the authors which is aimed at improved performance when used as a single drain in thoracic surgery.

Future work will aim to evaluate this drain design in clinical practice.

The primary aim of this work is outlined above. However, there were a number of objectives to achieve in this work:

1. To identify the best evidence available regarding the insertion of thoracic drains post-lobectomy from the previously published literature
2. To evaluate the evidence found from randomised controlled trials (RCTs) comparing single chest drain insertion with double chest drain insertion and examining the variables of post-operative pain, length of stay and cost-effectiveness. To determine if there is a significant benefit to the routine insertion of double chest drains in patient's post-lobectomy

3. To design an improved chest, drain tube which further enhances post-operative drainage in a single-drain approach.

Search Strategy

The Medline database was searched using PubMed and OVID interfaces. Search string: [Lobectomy.mp OR Lung resection\$.mp] AND [chest drain\$.mp OR exp Chest tubes OR Chest Tube\$.mp].

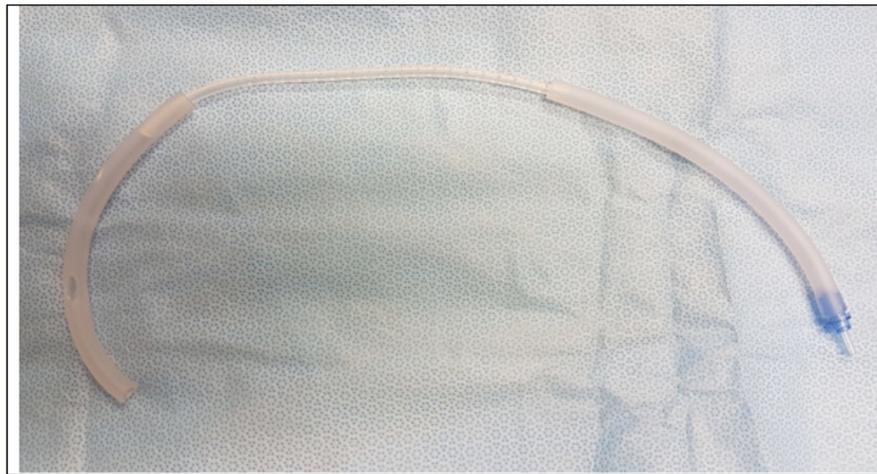
Overall 243 papers were identified in this search 2006-2018. Only a total of 6 papers describing RCTs or case series were retrieved as best available evidence. Almost all were from the previous decade as work has stagnated in this area regards best evidence material.

Study	Control	Intervention	Findings
Alex., <i>et al.</i> 2003 [1]	Two 28Fr Drains, Apical and Basal (n = 60)	Single 28Fr Drain, mid-position (n = 60)	Significant reduction in pain score in the single-drain group (1.4 ± 0.8 vs. 1.02 ± 0.7, respectively, P = 0.02)
Gomez-Caro, <i>et al.</i> 2006 [2]	Two 28Fr Drains, Apical-Anterior and Basal-Posterior (n = 59)	Single 28Fr Drain, mid-position basal cavity (n = 60)	No significant difference in pain score Significantly higher IV morphine requirement in double drain group (n = 9, 10.1% vs. n = 1, 1.6%; P = 0.0003) Cost Saving of €212.67 ± €7.60 per patient.
Okur., <i>et al.</i> 2008 [3]	Two 32Fr Drains, mid-Axillary and Anterior-Axillary (n = 50)	Single 32Fr Drain, Mid-Axillary (n = 50)	Single drain resulted in reduced pain score: <ul style="list-style-type: none"> • Early Post-operative period (4.28 ± 0.21 vs. 5.10 ± 0.23; P = 0.014) • Late postoperative period (1.48 ± 0.13 vs. 2.00 ± 0.17; P = 0.01).
Pawelczyk, <i>et al.</i> 2007 [4]	Two Drains, Apical and Basal positions (n = 93)	Single Drain, Mid-position (n = 90)	Single drain group, shorter: <ul style="list-style-type: none"> • Period of opioid use (4.8 days vs. 5.6 days; P = 0.0001) • NSAID use (6.8 days vs. 7.7 days; P = 0.002) • Length of stay (7.6 days vs. 9.0 days; P = 0.001)
Kejriwal, <i>et al.</i> 2005 [5]	Single 19Fr silastic drain Case series (n = 37)	Mean drainage volume was 322 ml (Range 50 - 800 ml). No residual pleural effusion Mean drainage of 4.3 days	
Icard., <i>et al.</i> 2006 [6]	Single 24Fr Blake drain, position dependent on lobe resected (n = 100)	Median duration of drainage was 5 days (range 3 - 15 Days) No increased rate of drain re-insertion	

A new drain design

Following appraisal of the available literature and based upon our experience, it is clear that single tube drainage is not inferior to the placement of two chest drains. Given that drainage was similar in both a one drain and two drain model, the authors of this study attempted to redesign the thoracic drainage tube to further improve the drainage properties through a single tube. The authors are quite satisfied after testing it on mannequin’s with fluids made up of different consistencies and mock variable consistency contents with and without suction of up to 20 cmH₂O pressure. We feel an ideal drain size should be between size 28F to 32F and we have no current exposure to paediatric drains.

A mock-up of a proposed drainage tubing is shown below.



Curved Distal Portion		Standard connection
Enables drain to follow contour of thoracic cage and sit securely within costo-diaphragmatic recess or apical pleural cavity		Allowing compatibility with current drainage devices such as Sahara® and Rocket® etc.,
Mid-Section	Narrower lumen to allow greater flexibility in positioning of tube. Increased number of perforations to allow maximal drainage from entire pleural cavity.	
Distal Section	Additional large diameter drainage hole to enable maximum rate of drainage in dependent area of thoracic cavity	

Bibliography

1. Alex J., et al. "Comparison of the immediate postoperative outcome of using the conventional two drains versus a single drain after lobectomy". *Annals of Thoracic Surgery* 76.4 (2003): 1046-1049.
2. Gomez-Caro A., et al. "Successful use of a single chest drain postlobectomy instead of two classical drains: a randomized study". *European Journal of Cardio-Thoracic Surgery* 29.4 (2006): 562-566.
3. Okur E., et al. "Comparison of the single or double chest tube applications after pulmonary lobectomies". *European Journal of Cardio-Thoracic Surgery* 35.1 (2009): 32-36.
4. Pawelczyk K., et al. "One or two drains after lobectomy? A comparison of both methods in the immediate postoperative period". *Thoracic and Cardiovascular Surgeon* 55.5 (2007): 313-316.
5. Kejriwal NK and MA Newman. "Use of a single silastic chest drain following thoracotomy: initial evaluation". *ANZ Journal of Surgery* 75.8 (2005): 710-712.
6. Icard P., et al. "A single 24F Blake drain after wedge resection or lobectomy: a study on 100 consecutive cases". *European Journal of Cardio-Thoracic Surgery* 30.4 (2006): 649-651.

Volume 8 Issue 7 July 2019

©All rights reserved by Syed Mohiyaddin., et al.