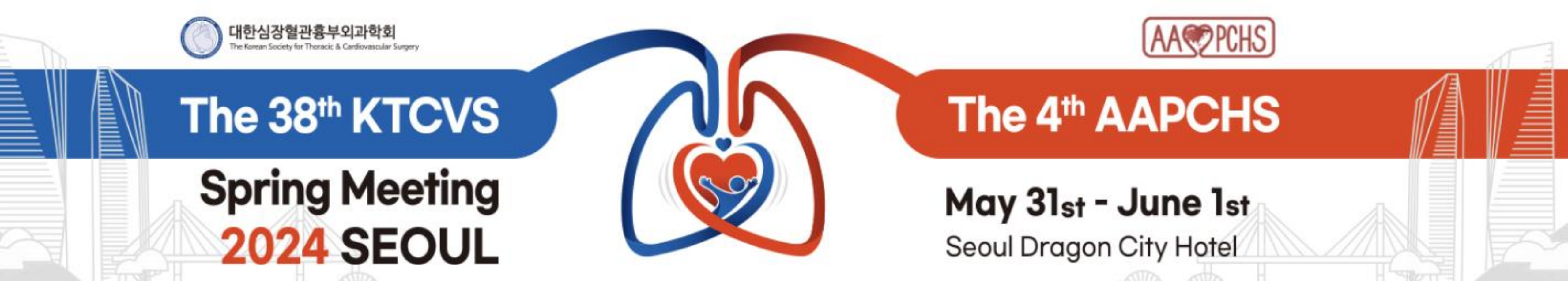
Recurred or Malignant case

칠곡경북대학교병원
도영우



10:00~11:30	**Session 5. Nothing but Guidelines (Real World)**	**장지원(제주대학교병원)**
10:15~10:30	Epidemiology	장효준(한양대학교병원)
10:30~10:45	Non-surgical management	신수민(이화여자대학교목동병원)
10:45~11:00	Surgical management	강두영(강북삼성병원)
11:00~11:15	Recurred or Malignant case	도영우(경북대학교병원)
11:15~11:30	Panel discussion	변천성(원주세브란스기독병원) 남승혁(충북대학교병원)

Br. J. Dis. Chest (1987) *81*, 209

Problems in Practice

THE DIFFICULT PNEUMOTHORAX

J. E. HARVEY AND K. JEYASINGHAM

Southmead Hospital and Frenchay Hospital, Bristol

The first difficulty in managing patients with a pneumothorax is in deciding which of them actually need a drainage procedure and which procedure to use. Obviously patients who are left severely breathless or those with signs of tension require immediate drainage but guidelines for the majority of cases are not clear.

This is not a new problem. Twenty years ago, in consecutive papers in the same journal, a strong case was made from a surgical unit in Edinburgh for intercostal drainage, followed by an equally persuasive paper from a medical unit in London highlighting the benefits of a conservative approach (1, 2). Even the least conservative clinicians would probably leave alone patients who have less than 20% of their lung collapsed. Those with larger pneumothoraces may also do just as well with a conservative approach even though it may take 6 weeks for a 50% pneumothorax to resorb.

The 3rd Pneumothorax Symposium, 2023

2023. 3. 4. (토) 08:00
강남세브란스병원 3층 대강당

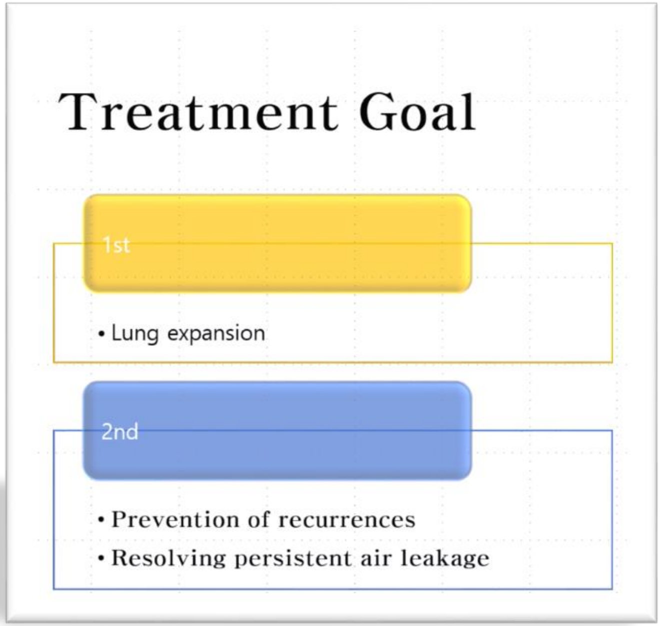
초대의 글 | INVITATION

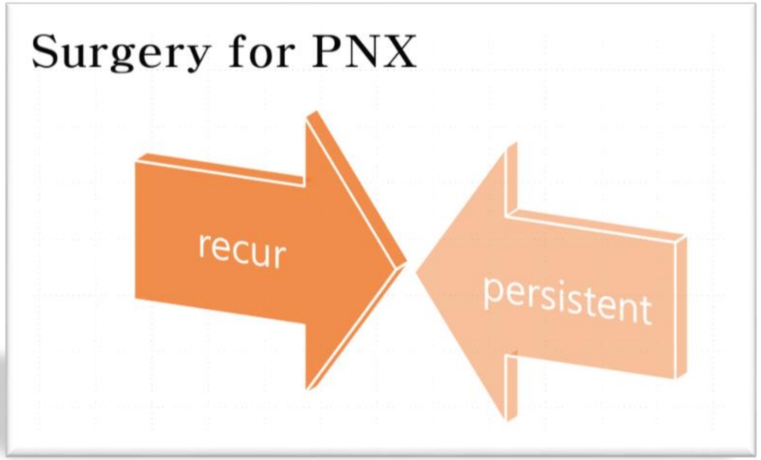
안녕하십니까?
계묘년를 맞이하여 회원님들의 건강과 행복을 기원합니다.
대한심장혈관흉부외과 산하 기흉연구회에서 2023년 3월 4일(토)에 "Pneumothorax symposium, 2023"을 준비하였습니다.
이번 Symposium은 2022년 기흉연구회가 공식 승인된 후 처음 시행되는 meeting으로 다양한 주제를 바탕으로 여러 경험 많은 연자들과 심도 깊은 논의와 증례발표를 통해 다양한 경험을 활발히 공유하고자 합니다. 특히 어떤 chest bottle이 좋은 지에 대한 know-how를 토론하는 세션도 마련했습니다.
전문의뿐만 아니라 전공의들도 참여하여 편안하게 의견을 주고 받는 자리가 되었으면 합니다. 많은 참여와 관심을 부탁드립니다.

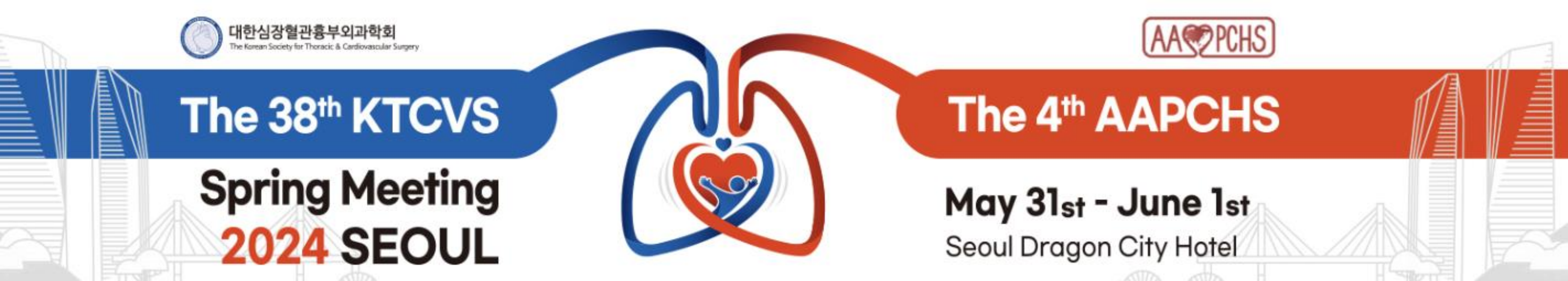
기흉연구회 회장
강남세브란스병원 흉부외과 이성수 배상

프로그램 | PROGRAM

08:00 - 08:10	Registration	
08:10 - 08:20	Opening remark	이성수 (연세대 강남세브란스병원)
08:20 - 09:40	**Session I. Air-leak control**	좌장: 이호석 (부산대학교병원)
08:20 - 08:35	Surgical management of postoperative persistent air-leak	채민철 (계명대학교 동산병원)
08:35 - 08:50	Pleurography indication and practical know-how	안효영 (부산대학교병원)
08:50 - 09:05	Chemical pleurodesis for treatment of continuous air-leak	장용진 (가톨릭대학교 성빈센트병원)
09:05 - 09:20	Pleural pressure monitoring after thoracic surgery	최세훈 (울산대 서울아산병원)
09:20 - 09:40	Panel discussion and Q&A	정우현 (분당 서울대학교병원), 윤주식 (화순전남대병원)
09:40 - 10:30	**Session II. Coverage material (ORC vs PGA)**	좌장: 강두영 (성균관대 강북삼성병원)
09:40 - 09:50	Plerual coverage using ORC after VATS bullectomy	손주형 (양산부산대학교병원)
09:50 - 10:00	Pleural coverage using PGA after VATS bullectomy	윤주식 (화순전남대병원)
10:00 - 10:15	Panel discussion and Q&A	이용직 (울산대학교병원), 조현진 (세종충남대병원)
10:15 - 10:30	Coffee break	
10:30 - 13:00	**Session III. Something new wave in pneumothorax**	좌장: 이성수 (연세대 강남세브란스병원), 조석기 (분당 서울대병원)
10:30 - 10:45	Conservative versus interventional management for pneumothorax	나권중 (서울대학교병원)
10:45 - 11:00	Pneumothorax size can be an absolute indication for surgery?	도영우 (칠곡경북대병원)
11:00 - 11:15	Portable small-bore chest tube (Egg) for pneumothorax treatment	문덕환 (연세대학교 강남세브란스병원)
11:15 - 11:30	Uniport approach for pneumthorax surgery	조현진 (세종충남대병원)
11:30 - 11:50	Panel discussion and Q&A	문미형 (가톨릭대학교 서울성모병원), 정재호 (고려대학교안암병원)
11:50 - 13:00	Lunch	
13:00-14:25	**Session IV. Which "chest bottle" is best?**	좌장: 이응배 (칠곡 경북대병원)
13:00 - 13:10	Thopaz™ with digital chest draianage and monitor system	정우현 (분당 서울대학교병원)
13:10 - 13:20	DRENTECH™ PALM EVO digital airleakage monitoring	성용원 (서울특별시 보라매병원)
13:20 - 13:30	Clinical application of ATMOS® digital thoracic drainage system	이우성(건국대학교 충주병원)
13:30 - 13:40	SINAPI™ chest drain	한국남 (중앙대학교 광명병원)
13:40 - 13:50	Conventional chest bottle	김영웅 (연세대학교 강남세브란스병원)
13:50 - 14:10	Panel discussion and Q&A	황진욱 (고려대학교 안산병원), 문덕환 (연세대 강남세브란스병원)
14:10 - 14:25	Coffee break	
14:25 - 15:05	**Session V. Case Discussion**	좌장: 함석진 (아주대학교병원)
14:25 - 14:35	Frequently recurring pneumothorax after ater surgery: who are optimal candidate for another surgery?	우원기 (연세대학교 강남세브란스병원)
14:35 - 14:45	Epidemiological consideration for primary spontaneous pneumothorax	배미경 (국민건강보험 일산병원)
14:45 - 14:55	Analysis of pneumothorax with Duchenne muscular dystrophy	이지민 (연세대학교 강남세브란스병원)
14:55 - 15:05	Thoracoscopic management of giant emphysematous bullae; case report: lobectomy vs ligation of bullae	이종근 (부산대학교병원)
15:05 - 15:10	Closing remark	이성수 (연세대 강남세브란스병원)







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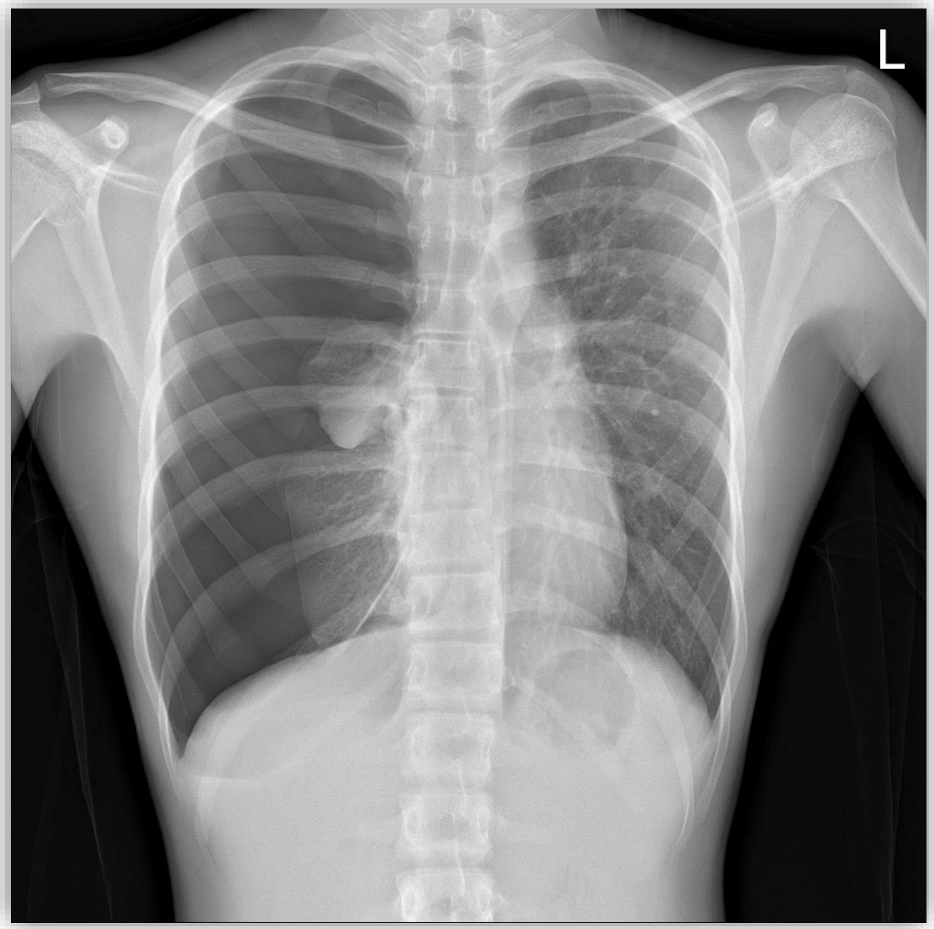
“심하다”

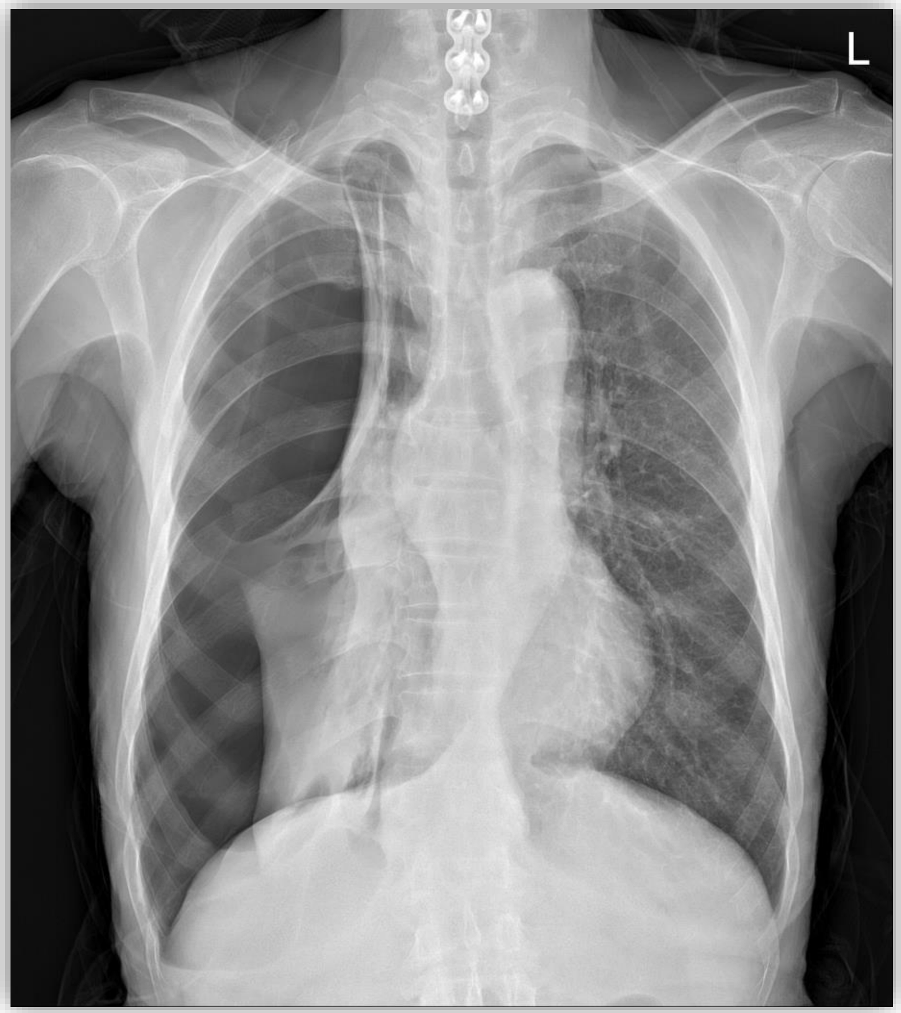
〈국어사전〉

정도가 지나치다.

유의어: 깊다, 끔찍하다, 너무하다

기흉이 심하다?





기흉이 심하다?

Specialist

- 흉관삽입술 이후 해결이 안 된다.
- 치료 이후 재발을 자주한다.
- 수술을 들어 갔는데 어떻게 수술을 해야 할지 모르겠다.
- 기저질환이 심하다.

지속

- 지속되는 공기 유출
- 많은 양의 공기 유출

재발

- 수술 후 재발
- 전신마취에 대한 위험성이 높은 환자 상태

수술

- 심한 유착
- 찾을 수 없는 공기유출 부위
- 상황에 따른 술기 방법

Recurred or Malignant Case

지속

흉관삽입술 이후 해결이 안 된다

- 지속되는 공기 유출
- 많은 양의 공기 유출

지속

CHEST

Management of Persistent Air Leaks

Karen C. Dugan, MD; Balaji Laxmanan, MD; Septimiu Murgu, MD, FCCP; and D. Kyle Hogarth, MD, FCCP

Alveolar-pleural fistulas causing persistent air leaks (PALs) are associated with prolonged hospital stays and high morbidity. Prior guidelines recommend surgical repair as the gold standard for treatment, albeit it is a solution with limited success. In patients who have recently undergone thoracic surgery or in whom surgery would be contraindicated based on the severity of illness, there has been a lack of treatment options. This review describes a brief history of treatment guidelines for PALs. In the past 20 years, newer and less invasive treatment options have been developed. Aside from supportive care, the literature includes anecdotal successful reports using fibrin sealants, ethanol injection, metal coils, and Watanabe spigots. More recently, larger studies have demonstrated success with chemical pleurodesis, autologous blood patch pleurodesis, and endobronchial valves. This manuscript describes these treatment options in detail, including postprocedural adverse events. Further research, including randomized controlled trials with comparison of these options, are needed, as is long-term follow-up for these interventions.

CHEST 2017; 152(2):417-423

KEY WORDS: bronchopleural fistula; persistent air leak; pneumothorax

An alveolar-pleural fistula is a communication between the alveoli and the pleural space. This connection will lead to the development of a pneumothorax as air escapes the lung into the pleural cavity. If this connection persists, there will be flow of air from the lung parenchyma to the pleural space and worsening of the pneumothorax. Once a chest tube is inserted, air bubbling into the chest drainage system indicates an air leak. The flow of air through the fistulous tract into the pleural space delays healing and inhibits lung expansion. Although a majority of pneumothoraces resolve with thoracostomy tube drainage, many continue days after the lung injury. If an air leak lasts > 5 to 7 days, it is termed a persistent air leak (PAL). A PAL is commonly caused by a spontaneous pneumothorax from underlying

lung disease (seconda... pneumothorax), pulm... complications of mec... following chest traum... surgery.

There have been a fe... classifications that at... severity of PALs in th... including the most c... Cerfolio[1] which grad... whether the leak is e... and the amount of ai...

Further categorizatio... observing the water s... drainage system. Mo... systems have three c... chamber collects flui...

ABBREVIATIONS: EBV = endobronchial valve; IBV = intrabronchial valve; LVRS = lung volume reduction surgery; PAL = persistent air leak

AFFILIATIONS: From the Department of Medicine, Section of Pulmonary and Critical Care, University of Chicago, Chicago, IL.

CORRESPONDENCE TO: D. Kyle Hogarth... Medicine, Section of Pulmonary and Cr... Ave, Chicago, IL 60637; e-mail: dhogarth...

DOI: http://dx.doi.org/10.1016/j.chest.201...

Chest 2017; 152(2):417-423

지속

흉관삽입술 이후 해결이 안 된다

- Large bore chest tube
- Additional thoracostomy
- External suction
- Collar incision

Management

지속

Original Article

Negative pressure wound therapy for massive subcutaneous emphysema: a systematic review and case series

Nicky Janssen, Iris E. W. G. Laven, Jean H. T. Daemen, Karel W. E. Hulsewé, Yvonne L. J. Vissers, Erik R. de Loos

Department of Surgery, Division of General Thoracic Surgery, Zuyderland Medical Centre, Heerlen, The Netherlands

Contributions: (I) Conception and design: N Janssen, ER de Loos; (II) Administrative support: N Janssen, JHT Daemen, IEWG Laven; (III) Provision of study materials or patients: KWE Hulsewé, YLJ Vissers, ER de Loos; (IV) Collection and assembly of data: N Janssen, IEWG Laven; (V) Data analysis and interpretation: N Janssen, JHT Daemen, ER de Loos; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Erik R. de Loos, MD. Department of Surgery, Division of General Thoracic Surgery, Zuyderland Medical Centre, Henri Dunantstraat 5, 6419PC, Heerlen, The Netherlands. Email: e.deloos@zuyderland.nl.

Background: Massive subcutaneous emphysema can cause considerable morbidity with respiratory distress. To resolve this emphysema in short-term, negative pressure wound therapy could be applied as added treatment modality. However, its use is sparsely reported, and a variety of techniques are being described. This study provides a systematic review of the available literature on the effectiveness of negative pressure wound therapy as treatment for massive subcutaneous emphysema. In addition, our institutional experience is reported through a case-series.

Methods: The PubMed, Embase and Cochrane Library were systematically searched for publications on the use of negative pressure wound therapy for subcutaneous emphysema following thoracic surgery, trauma or spontaneous pneumothorax. Moreover, patients treated at our institution between 2019 and 2021 were retrospectively identified and analyzed.

Results: The systematic review provided 10 articles presenting 23 cases. Studies demonstrated considerable heterogeneity regarding the location of incision, creation of prepectoral pocket, and surgical safety margin. Also closed incision negative pressure wound therapy and PICO® device were discussed. Despite the apparent heterogeneity, all techniques provided favorable outcomes. No complications, reinterventions or recurrences were documented. Furthermore, retrospective data of 11 patients treated at our clinic demonstrated an immediate response to negative pressure wound therapy and a full remission of the subcutaneous emphysema at the end of negative pressure wound therapy. No recurrence requiring intervention or complications were observed.

Conclusions: The findings of this study suggest that negative pressure wound therapy, despite the varying techniques employed, is associated with an immediate regression of subcutaneous emphysema and full remission at the end of therapy. Given the relatively low sample size, no technique of choice could be identified. However, in general, negative pressure wound therapy appears to provide fast regression of subcutaneous emphysema and release of symptoms in all cases.

Keywords: Negative pressure wound therapy; subcutaneous emphysema; systematic review; case series

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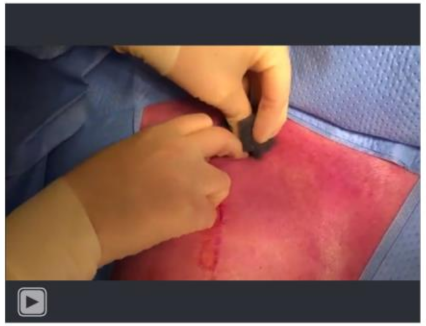
doi: 10.21037/jtd-21-1483
View this article at: https://dx.doi.org/10.21037/jtd-21-1483

Figure 1 Preoperative markings for the blowhole incision. The right clavicula is also marked in this case to illustrate the position of the blowhole incision with respect to the clavicula. A chest tube is in situ. This image is published with the patient's consent.



Video 1 Surgical technique: infra- and midclavicular incision, and placement of NPWT foam and dressing. NPWT, negative pressure wound therapy.

Figure 3 Photographs of the monitoring of a patient with massive subcutaneous emphysema during hospitalization. (A) Prior to initiation of NPWT. (B) 6 hours after start of NPWT. Immediate improvement after NPWT is notable. (C) 24 hours after start of NPWT. (D) 48 hours after start of NPWT. This image is published with the patient's consent. NPWT, negative pressure wound therapy.

Figure 4 Anteroposterior plain radiographs showing the course of subcutaneous emphysema before and after NPWT. (A) Chest radiograph prior to initiation of NPWT showing massive subcutaneous emphysema and a right-sided pneumothorax of 5 cm. (B) Chest radiograph 48 hours after start of NPWT demonstrating substantial improvement of subcutaneous emphysema and pneumothorax. (C) Chest radiograph 5 days after start of NPWT, presenting only a small amount of residual subcutaneous emphysema. NPWT, negative pressure wound therapy; L, patient's left side.

J Thorac Dis 2022;14(1):43-53

지속

- 지속되는 공기 유출
- 많은 양의 공기 유출

재발

- 수술 후 재발
- 전신마취에 대한 위험성이 높은 환자 상태

수술

- 심한 유착
- 찾을 수 없는 공기유출 부위
- 상황에 따른 술기 방법

Recurred or Malignant Case

치료 이후 재발을 자주한다

- 수술 후 재발
- 전신마취에 대한 위험성이 높은 환자 상태

재발

Surg Today (2010) 40:696–699
DOI 10.1007/s00595-009-4208-1

SURGERY TODAY

Review Article

Preventing Recurrence of Spontaneous Pneumothorax After Thoracoscopic Surgery: A Review of Recent Results

Takashi Muramatsu, Tatsuhiko Nishii, Shinji Takeshita, Shinichirou Ishimoto, Hiroaki Morooka, and Motomi Shiono

Division of Respiratory Surgery, Department of Surgery, Nihon University School of Medicine, 30-1 Oyaguchikamimachi, Itabashi-ku, Tokyo 173-8610, Japan

Abstract
Spontaneous pneumothorax (SP) is now commonly treated with thoracoscopic surgery, which is associated with less pain and a shorter hospital stay than thoracotomy; however, in its initial stages, thoracoscopic stapled bullectomy resulted in an unexpectedly high incidence of postoperative SP recurrence. Thus, new thoracoscopic procedures, designed to be performed in addition to stapled bullectomy, were developed, which resulted in a gradual decline in the postoperative recurrence rate. We review the recent literature on SP recurrence after thoracoscopic surgery with these other surgical procedures. Pleurectomy and pleural abrasion have been performed for a long time with low recurrence rates; however, they cause the lung to adhere to the parietal pleura, often resulting in complications such as postoperative bleeding. Other surgical procedures that may be recommended to minimize the risk of recurrence are reinforcement of the staple lines using fleece-coated glue or an absorbable sheet. These procedures are now considered to be the thoracoscopic treatment of choice for SP.

Key words Thoracoscopic surgery · Postoperative pneumothorax recurrence · Spontaneous pneumothorax

Introduction

Advances in thoracoscopic surgery and its ensuing popularity resulted in a sudden shift from thoracotomy to thoracoscopic surgery for the treatment of spontaneous pneumothorax (SP) in the 1990s.[1–4] However, after an unexpectedly high rate of postoperative SP recurrence after thoracoscopic surgery was verified,[2,5,6] a series of reports advocated a return to thoracotomy as a radical operative method for SP with a low recurrence rate.[1–3,5,7–10,11] Subsequently, other thoracoscopic surgical procedures, in addition to stapled bullectomy only, were developed and the postoperative recurrence rate gradually declined.[6,12–16] Now, the postoperative recurrence rate of SP is equal to or lower than that after thoracotomy. We review the recent published reports on the recurrence of SP after thoracoscopic surgery.

Reprint requests to: T. Muramatsu
Received: July 14, 2009 / Accepted: November 5, 2009

SP Recurrence After Stapled Bullectomy Only and Causal Factors

Although there are not many reports summarizing the postoperative results of thoracoscopic stapled bullectomy only, the recurrence rate is estimated at approximately 10%–20% (Table 1).[5,6,11,16] The major causal factor of this high recurrence rate is new bulla formation which, according to many reports, occurs mainly near the staple lines.[6,13,16] Therefore, it is now suggested that additional surgical procedures and remedial measures, other than bullectomy with a stapler, are necessary to ensure a low recurrence rate.

Thoracoscopy Versus Thoracotomy

Although many studies have compared the results of standard thoracotomy, mainly in the form of axillary thoracotomy, with those of thoracoscopic surgery,[1–3,5,7–10] the majority involved a combination of procedures, such as pleurectomy and pleural abrasion in addition to thoracoscopic stapled bullectomy, for SP. Therefore, few comparisons have been made between thoracoscopic stapled bullectomy only and a standard thoracotomy.[5] Despite the fact that the hospital stay was shorter for thoracoscopic surgery than for standard thoracotomy, the postoperative recurrence rate was high (Table 2).

Table 1. Recurrence rates of spontaneous pneumothorax after thoracoscopic stapled bullectomy

First author[Ref.]	Patients	Year	Recurrence (%)	Follow-up (months)
Horio[5]	50	2002	16	38
Muramatsu[6]	310	2007	10	13.4
Nakanishi[11]	45	2009	24.5	43.5
Sakamoto[16]	126	2004	9.5	ND

ND, neither described nor discernible from the study

Surg Today 2010; 40:696-699

재발


Surg Today (2010) 40:696–699
DOI 10.1007/s00595-009-4208-1
SURGERY TODAY
© Springer 2010
Review Article
Preventing Recurrence of Spontaneous Pneumothorax After Thoracoscopic Surgery: A Review of Recent Results
Takashi Muramatsu, Tatsuhiko Nishii, Shinji Takeshita, Shinichirou Ishimoto, Hiroaki Morooka, and Motomi Shiono
Division of Respiratory Surgery, Department of Surgery, Nihon University School of Medicine, 30-1 Oyaguchikamimachi, Itabashi-ku, Tokyo 173-8610, Japan

Table 2. Recurrence rates of spontaneous pneumothorax after video-assisted thoracoscopic versus open surgery

First author[Ref.]	Patients	Follow-up (months)	Access VATS	Access Open	Procedures VATS	Procedures Open	Recurrence (%) VATS	Recurrence (%) Open
Crisci[1]	60	ND	VATS	PLT	Limited pleurectomy	Pleurectomy, pleura abrasion	6.7	0
Kim[2]	66	6–24	VATS	AXT	Pleura abrasion	ND	11.1	0
Radberg[3]	49	12	VATS	ND	Pleurectomy	Pleurectomy	0	0
Horino[5]	95	26.8	VATS	AXT	No pleurodesis	No pleurodesis	13.7	6.8
Ayed[7]	60	36.5	VATS	PLT	Limited pleurectomy	Limited pleurectomy	10	0
Dumont[8]	338	61.7	VATS	AXT	Pleura abrasion	Pleura abrasion	3	0.4
Sawada[9]	187	78.3	VATS	PLT	Pleura abrasion	ND	11.7	3
Waller[10]	60	15.9	VATS	PLT	Limited pleurectomy	Limited pleurectomy	6.7	3.3

VATS, video-assisted thoracoscopic surgery; AXT, axillary thoracotomy; PLT, posterolateral thoracotomy; ND, neither described nor discernible from the study

Table 3. Additional procedure without thoracoscopic stapled bullectomy

- Parietal pleura
  - Pleurectomy (limited, extensive)
  - Chemical pleurodesis (talc, minocycline, silver nitrate)
  - Mechanical abrasion (gauze abrasion)
  - Argon beam coagulation
  - Laser ablation
- Visceral pleura
  - Endoscopic suturing
  - Endoloop ligation
  - Autologous blood
  - Staple line covering
    - Absorbable mesh (Vicryl mesh)
    - Absorbable cellulose mesh (Surgicel)
    - Polyglycolic acid sheet (Neovel)
    - Fleece-coated fibrin glue (Tachocomb)

Table 4. Comparison of additional procedure

First author[Ref.]	Year	Patients	Additional procedures	Recurrence (%)	Follow-up (months)
Crisci[1]	1996	22	Limited pleurectomy	6.6	ND
Ayed[7]	2000	30	Limited pleurectomy	10.0	36
Hazama[14]	2003	57	Laser ablation	3.3	4–45
Sakamoto[16]	2004	114	Mesh (Vicryl mesh) coverage	2.6	25
Chen[12]	2006	103	Chemical pleurodesis (minocycline)	1.9	29
Cardillo[17]	2006	805	Talc poudrage	1.73	52.5
Chang[18]	2006	30	Mechanical abrasion	8.6	19
Bobbio[23]	2006	70	Argon beam coagulation	10.7	41
Marcheix[15]	2007	603	Silver nitrate	1.1	ND
Muramatsu[6]	2007	163	Fleece-coated fibrin glue (TachoComb) coverage	1.22	13.4
Cho[13]	2008	98	Mesh (Vicryl mesh)/glue coverage	5.1	29

ND, neither described nor discernible from the study

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재발

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Optimal surgical technique in spontaneous pneumothorax: a systematic review and meta-analysis

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ABSTRACT

Background: Numerous thoracoscopic techniques have been used in the management of primary spontaneous pneumothorax (PSP), including wedge resection, pleurectomy, pleural abrasion, chemical pleurodesis, and staple line covering. The purpose of this systematic review was to compare outcomes for the most commonly reported techniques.
Materials and methods: A systematic literature search looking at pneumothorax recurrence rate, length of stay, and chest tube duration after surgery was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines using the PubMed database.
Results: Fifty-one unique studies comprised of 6907 patients published between January 1988 and June 2015 were identified. Heterogeneity among effect sizes was significant for all outcomes. The lowest recurrence rates were observed in the wedge resection + chemical pleurodesis (1.7%; 95% confidence interval [CI], 1.0%-2.7%) and the wedge resection + pleural abrasion + chemical pleurodesis (2.8%; 95% CI, 1.7%-4.7%) groups. The shortest chest tube duration and length of stay were observed in the wedge resection + staple line covering ± other group (2.1 d; 95% CI, 1.4-2.9 and 3.3 d; 95% CI, 2.6-4.0, respectively).
Conclusions: The variability in reported outcomes and the lack of published multicenter randomized controlled trials highlights a need for more robust investigations into the optimal surgical technique in the management of PSP. Based on the limited quality studies available, this systematic review favors wedge resection + chemical pleurodesis and wedge resection + pleural abrasion + chemical pleurodesis in terms of recurrence rate after surgery for PSP.

This study was presented, in part, at the 2016 Annual meeting of the Southeastern Surgical Congress held in Atlanta, GA on February 21, 2016.

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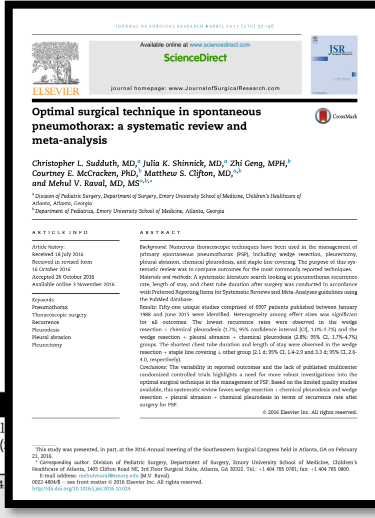
Table 1 – Studies included in the systematic review and meta-analysis.

Author	Year	Study design	Intervention	Number of patients	Age (y)*	SD or interquartile range (y)	Follow-up (mo)*	SD or interquartile range (mo)	CTD (d)*	SD or interquartile range (d)	LOS (d)*	SD or range	Recurrence (%)
Imperatori	2015	Retrospective	Wedge resection + pleurectomy	134	25	7	79	36-187					5.97
Min	2014	Prospective, randomized by surgical technique	Wedge resection	144	22	5	18		6	1	10	2	6.25
Min	2014	Prospective, randomized by surgical technique	Wedge resection + pleural abrasion	145	22								
Uramoto	2014	Retrospective	Wedge resection + staple line covering ± other	177	38.2								
Lee	2013	Retrospective	Wedge resection + pleural abrasion	128	23.67								
Lee	2013	Retrospective	Wedge resection + staple line covering ± other	129	21.69								
Yang	2013	Retrospective	Wedge resection + staple line covering ± other	13	27.1								
Chen	2012	Prospective, randomized by surgical technique	Wedge resection + pleurectomy	80	24.3								
Chen	2012	Prospective, randomized by surgical technique	Wedge resection + pleural abrasion + chemical pleurodesis	80	22.9								
Chou	2012	Retrospective	Wedge resection + pleural abrasion	89	24.26								
Foroulis	2012	Prospective	Wedge resection + pleurectomy	33	30.1								
Park	2012	Retrospective	Wedge resection	92	23.9								
Park	2012	Retrospective	Wedge resection + pleural abrasion	165	24.5	11.5	66.2		2.82	1.28			7.27
Chen	2011	Retrospective	Wedge resection + pleural abrasion	20	22.97								
Murumatsu	2011	Retrospective	Wedge resection	357	27.2								
Saito	2011	Retrospective	Wedge resection + staple line covering ± other	11	17								
Shaikhrezai	2011	Retrospective	Wedge resection + pleurectomy	41	28.4								
Shaikhrezai	2011	Retrospective	Wedge resection + chemical pleurodesis	189	28.4								
Shaikhrezai	2011	Retrospective	Wedge resection + pleural abrasion	255	28.4								
Chou	2009	Retrospective	Wedge resection + pleural abrasion	62	20								
Nakanishi	2009	Retrospective	Wedge resection + staple line covering ± other	157	28.1								
Bialas	2008	Retrospective	Wedge resection + pleural abrasion	31	16.5								
Cho	2008	Retrospective	Wedge resection + staple line covering ± other	424	24.9								
Nathan	2008	Retrospective	Wedge resection + pleurectomy	40	30								
Butterworth	2007	Retrospective	Wedge resection + pleural abrasion	10	14.6								
Marcheix	2007	Retrospective	Wedge resection + chemical pleurodesis	603	30.1								
Bobbio	2006	Retrospective	Wedge resection + pleural abrasion	67	27	14-40	76	1-106					2.99
Santillan-Doherty	2006	Retrospective	Wedge resection + pleurectomy	55	24	17-47	48	6-72			3.5	1.7	0
Chen	2004	Retrospective	Wedge resection + pleural abrasion	51	26.2								
Chen	2004	Retrospective	Wedge resection + pleural abrasion + chemical pleurodesis	313	24.9								
Cheng	2004	Prospective	Wedge resection + pleural abrasion	58	25.7								
Czerny	2004	Retrospective	Wedge resection + pleurectomy	69	35.3								
Freixinet	2004	Retrospective	Wedge resection + pleural abrasion	46	25.4								
Gossot	2004	Retrospective	Wedge resection + pleural abrasion	111	30.7								
Sakamoto	2004	Retrospective	Wedge resection + staple line covering ± other	114	29								
Sakamoto	2004	Retrospective	Wedge resection	126	30								
Chen	2003	Retrospective	Wedge resection + pleural abrasion	35	27.8								
Lang-Lazdunski	2003	Retrospective	Wedge resection + pleural abrasion	182	25.1								
Margolis	2003	Retrospective	Wedge resection + pleural abrasion + chemical pleurodesis	156	19								
Horio	2002	Retrospective	Wedge resection	50	32								
Horio	2002	Retrospective	Wedge resection + pleural abrasion	53	33								
Sawabata	2002	Retrospective	Wedge resection	55	27								
Chan	2001	Retrospective	Wedge resection + pleural abrasion	88	27	15-45	44						
Ayed	2000	Prospective	Wedge resection + pleurectomy	33	25	6	42	35-45	3	1	4.1	1	
Ayed	2000	Prospective	Wedge resection + pleural abrasion	39	25	6	42	35-45	3.5	2	4.5	2.1	
Cardillo	2000	Retrospective	Wedge resection + pleurectomy	122	28.4	12-69	38	2-72					
Cardillo	2000	Retrospective	Wedge resection + chemical pleurodesis	217	28.4	12-69	38	2-72					
Loubani	2000	Retrospective	Wedge resection	26	31.8	3.1	38	36-40	4.7	1	6.76	1.09	
Loubani	2000	Retrospective	Wedge resection + chemical pleurodesis	26	29	3.2	38	36-40	3.1	1.09	4.8	1.08	
Miller	2000	Retrospective	Wedge resection + pleurectomy	45	27	8	39	10.7			4.7	4.4	
Zijl	2000	Retrospective	Wedge resection + pleural abrasion + chemical pleurodesis	34	22	17-24	12		2	1-3	3	2-5	
Horio	1998	Retrospective	Wedge resection	51	34.8	16.4		3-42	2.2	3.1	6.4	5.2	
Rieger	1998	Retrospective	Wedge resection + pleurectomy	21	31.7	17-54	34		3.2	2-5	5.8	4-8	
Rieger	1998	Retrospective	Wedge resection	29	31.7	17-54	34		2.9	2-5	5.4	3-7	
Dumont	1997	Retrospective	Wedge resection + pleural abrasion	101	16		35	17-80	6.5	2-16	9.5	5-96	
Freixnet	1997	Retrospective	Wedge resection + pleural abrasion	234	26	13-38		10-36			5.6	2-15	
McCarthy	1997	Retrospective	Wedge resection + pleurectomy	42	36.7	17-84	18	1-31	2.7	.5-9	5.1		
Yim	1997	Retrospective	Wedge resection + pleural abrasion	196		13-102	20	1-36	1	1-17	2.5	1-19	
Bertrand	1996	Retrospective	Wedge resection + pleural abrasion	163	29.7	9	24.5	10	4.4	1.5	6.9	3	3.68
Kim	1996	Retrospective	Wedge resection + pleural abrasion	36	28	16.8	24				5	4	11.11
Mouroux	1996	Retrospective	Wedge resection + pleurectomy	20	37.2	17	30	49-70	4.89	1.41	7.5	1.5	0
Mouroux	1996	Retrospective	Wedge resection + pleural abrasion	69	37.2	17	30	49-70	5.44	2.1	8.2	3.2	2.90
Radberg	1995	Prospective	Wedge resection + pleurectomy	25	34	11-73	12						0
Yim	1995	Retrospective	Wedge resection + pleural abrasion	110		15-58	16		2		3		1.82
Waller	1994	Prospective	Wedge resection + pleurectomy	30	43	13-81	15.1	8-20					0.07

*Means reported where the SD is given and median reported where the interquartile range is given.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Materials and methods: A systematic literature search looking at pneumothorax recurrence rate, length of stay, and chest tube duration after surgery was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines using the PubMed database.
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Conclusions: The variability in reported outcomes and the lack of published multicenter randomized controlled trials highlights a need for more robust investigations into the optimal surgical technique in the management of PSP. Based on the limited quality studies available, this systematic review favors wedge resection + chemical pleurodesis and wedge resection + pleural abrasion + chemical pleurodesis in terms of recurrence rate after surgery for PSP.

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재발

수술을 진행하기는 어려운 환자의 전신상태

Predictors and Treatment of Persistent Air Leaks

Robert J. Cerfolio, MD, FACS, Cynthia Sale Bass, CRNP, Amanda Harrison Pask, RN, and Charles R. Katholi, PhD

Department of Biostatistics, University of Alabama at Birmingham, Birmingham, Alabama

Background. Air leaks prolong hospital stay.

Methods. A prospective algorithm was applied to patients. If patients were ready for discharge but still had an air leak, a Heimlich valve was placed and they were discharged. If the leak was still present after 2 weeks, the tube was clamped for a day and removed.

Results. There were 669 patients. Factors that predicted a persistent air leak were $FEV_{1\%}$ of less than 79% (p = 0.006), history of steroid use (p = 0.002), male gender (p = 0.05), and having a lobectomy (p = 0.01). Types of air leaks on day 1 that eventually required a Heimlich valve were expiratory leaks (p = 0.02), leaks that were an expiratory 4 or more ($p < 0.0001$), and the presence of a pneumothorax concomitant with an air leak ($p < 0.0001$). Thirty-three patients were placed on a Heimlich valve, and 6 patients had a pneumothorax or subcutaneous emphysema develop; all patients had an expiratory 5 leak or larger ($p < 0.0001$). Thirty-three patients went home on a valve. Seventeen patients had leaks that resolved by 1 week, 6 by 2 weeks, and the remaining 9 had their tubes removed without problems.

Conclusions. Steroid use, male gender, a large leak, a leak with a pneumothorax, and having a lobectomy are all risk factors for a persistent leak. Discharge on a Heimlich valve is safe and effective for patients with a persistent leak unless the leak is an expiratory 5 or more. Once home on a valve, most air leaks will seal in 2 weeks; if not, chest tubes can be safely removed regardless of the size of the leak or the presence of a pneumothorax.

(Ann Thorac Surg 2002;73:1727–31)

Air leaks continue to be the most common complication after pulmonary resection. In this article, predictors and a type of treatment for air leaks is evaluated. Previous randomized trials [1, 2] have shown that water seal is not only safe for patients with air leaks, but it is also superior to wall suction for stopping air leaks. However, despite the use of early water seal and a whole host of intraoperative techniques to help prevent air leaks, many patients still come out of the operating room with leaks. Even more frustrating is the fact that a significant number of these patients have persistent leaks. It is difficult to predict who these patients will be. In this article, risk factors for having a persistent air leak are identified. The results of a prospective algorithm to treat the problem of persistent air leaks are presented.

Material and Methods

Since January 1, 1999, an algorithm was applied to all patients who underwent elective pulmonary resections. All patients had routine preoperative evaluations before undergoing operations. This included pulmonary function testing, arterial blood gas, computed tomographic scan of the chest, positron emission tomographic scan, complete history, physical examination, and other appropriate tests. Patients who had lung cancer underwent either segmentectomy or lobectomy. Metastasectomy was performed by wedge resection if possible. If needed, however, segmentectomy or lobectomy was performed. Patients with lung cancer had complete thoracic lymphadenectomy.

Before chest closure, warm water was instilled in the chest. The lung was re-inflated and air leaks were pinpointed and sutured. Postoperatively, a previously described classification for air leaks was used [1, 2]. This classification system determines whether air leaks are expiratory, forced expiratory, inspiratory, or continuous. The type of leak is determined by asking the patient to take deep breaths in and out. If there is an air leak seen in the air leak meter, which is housed within the drainage system and used on all patients in this trial (Sahara S-1100 Pleur-evac Chest Drainage System; Genzyme Biosurgical, Cambridge, MA), then its size is determined. Leaks are measured from 1 (the smallest) to 7 (the largest). Patients' air leaks were scored daily on rounds by the surgeon in this series (RJC) and by his primary clinical nurse practitioner (CSB).

Algorithm Chest Tube Management

Chest tubes were managed as previously described [3]. In general, patients who underwent lobectomy received two chest tubes and those who had segmentectomy or wedge resection received one. All patients had their chest tubes placed on −20 cm of suction on the day of the operation. The tubes were converted to water seal on the morning of postoperative day (POD) 1. Patients remained on water seal unless they had an enlarging pneumothorax develop that was symptomatic or an enlarging subcutaneous

Presented at the Forty-eighth Annual Meeting of the Southern Thoracic Surgical Association, San Antonio, TX, Nov 8–10, 2001.

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지속

- 지속되는 공기 유출
- 많은 양의 공기 유출

재발

- 수술 후 재발
- 전신마취에 대한 위험성이 높은 환자 상태

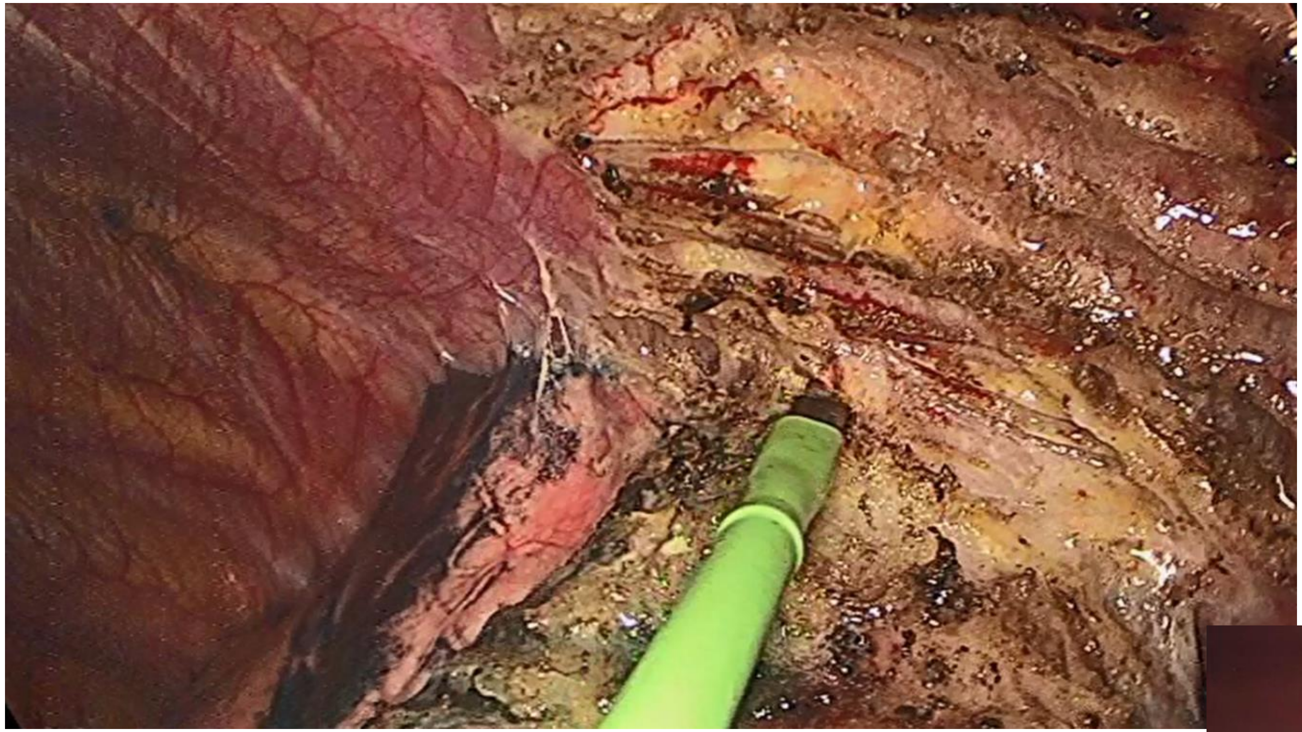
수술

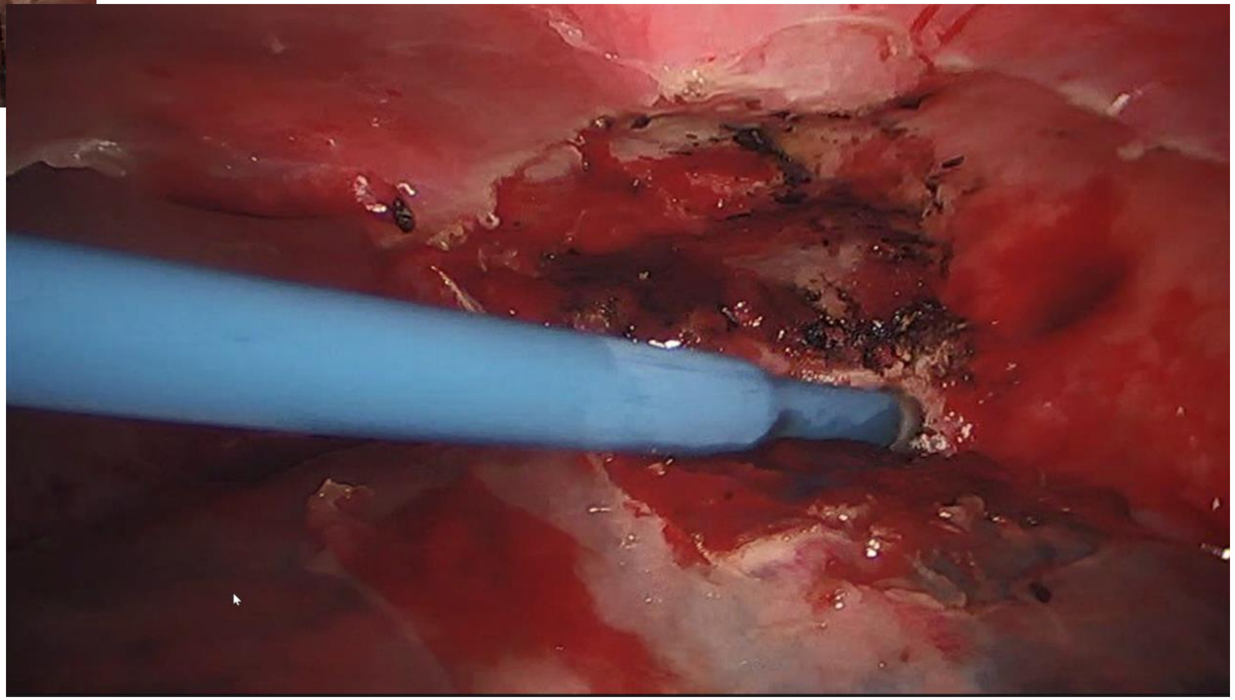
- 심한 유착
- 찾을 수 없는 공기유출 부위
- 상황에 따른 술기 방법

Recurred or Malignant Case

수술을 들어 갔는데 어떻게 수술을 해야 할지 모르겠다

- 심한 유착
- 찾을 수 없는 공기유출 부위
- 상황에 따른 술기 방법





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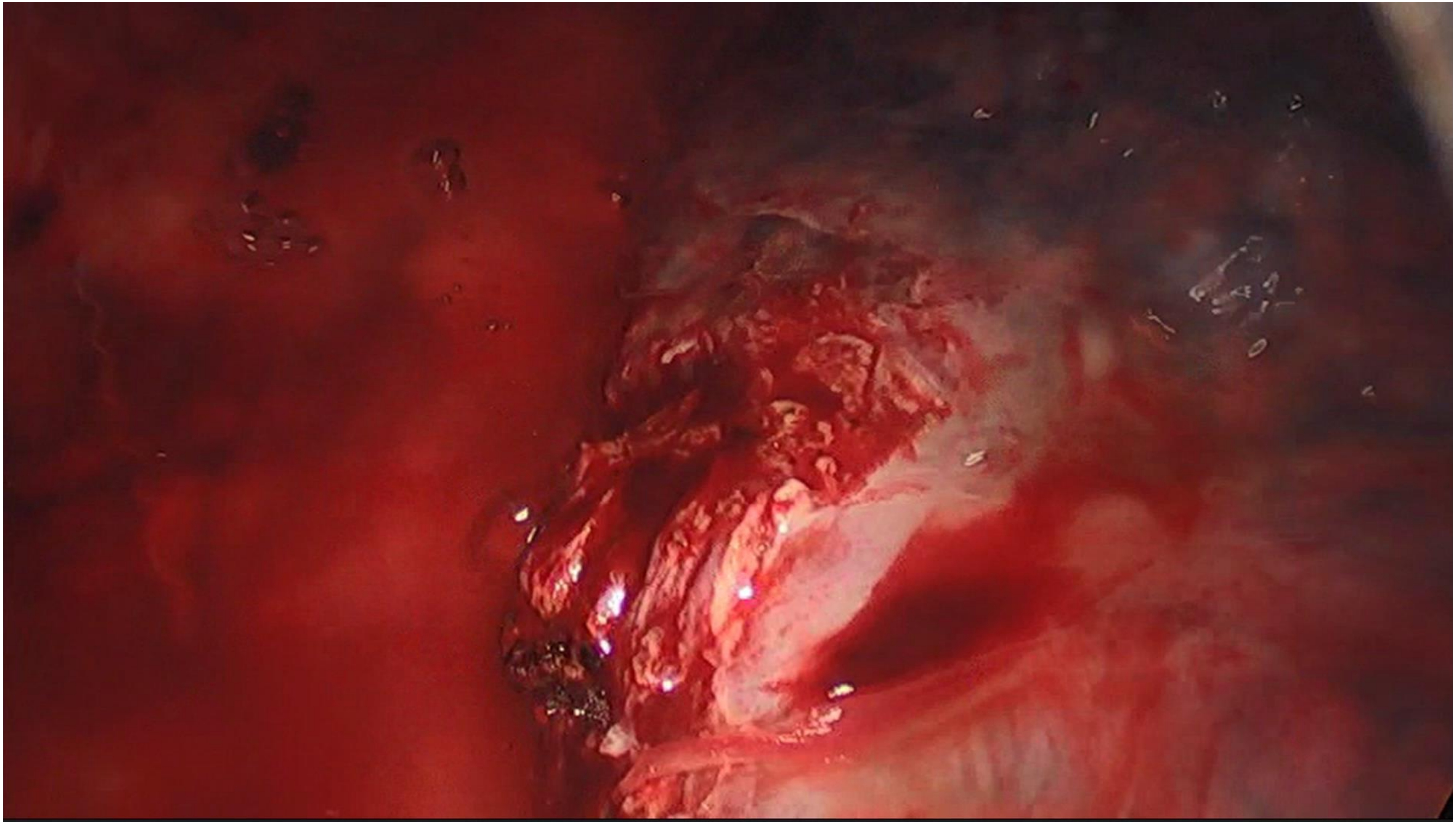

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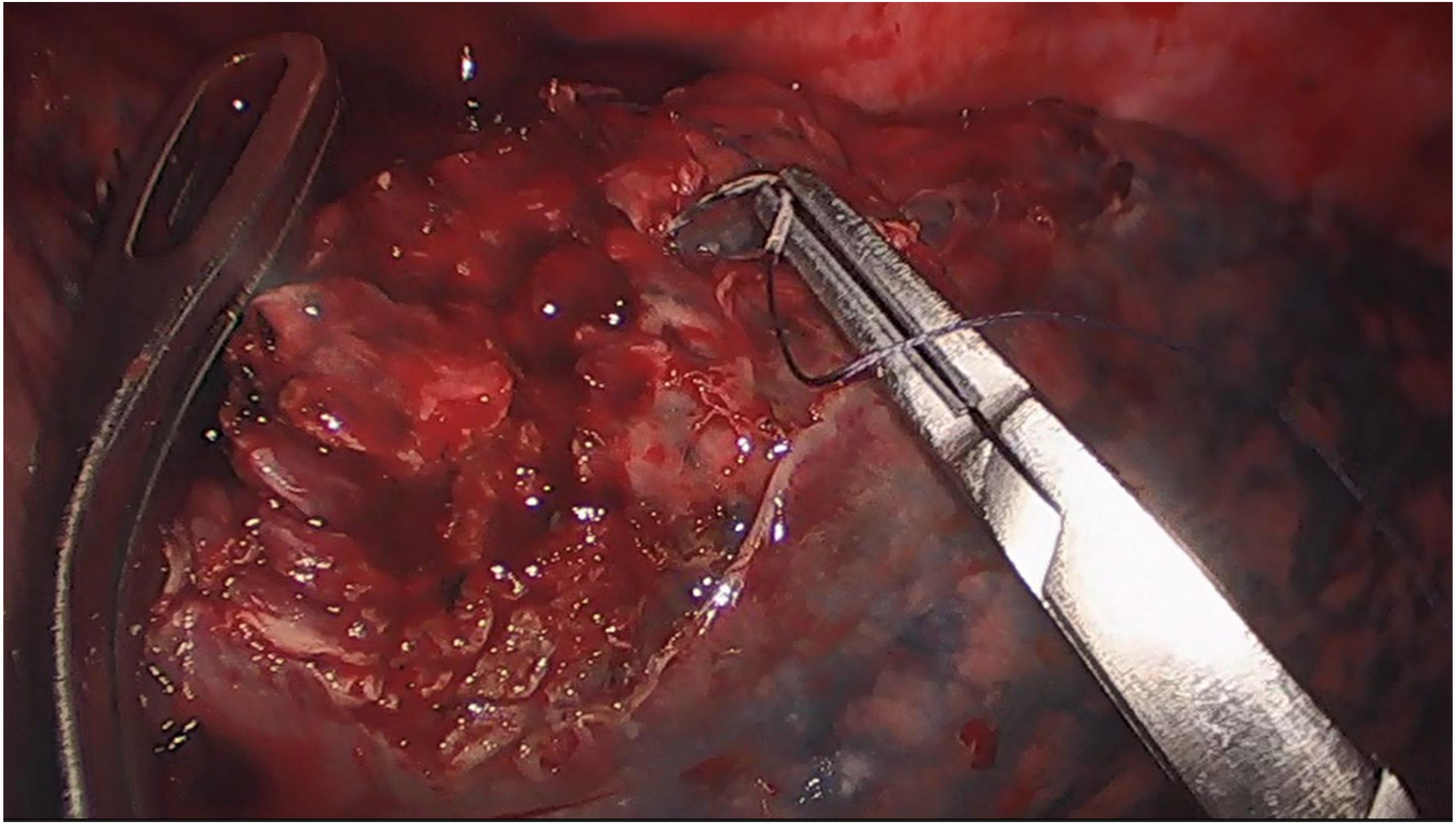

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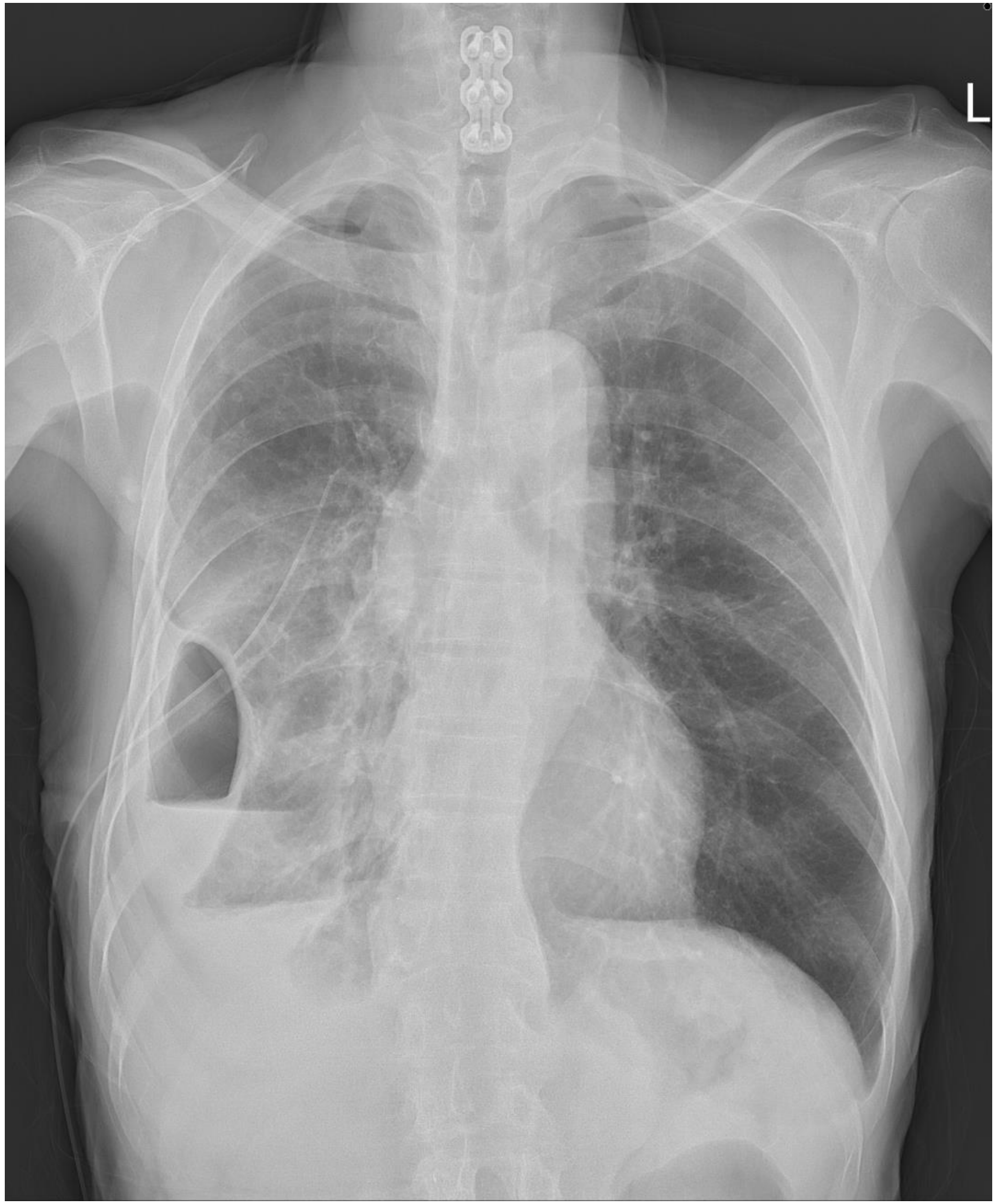

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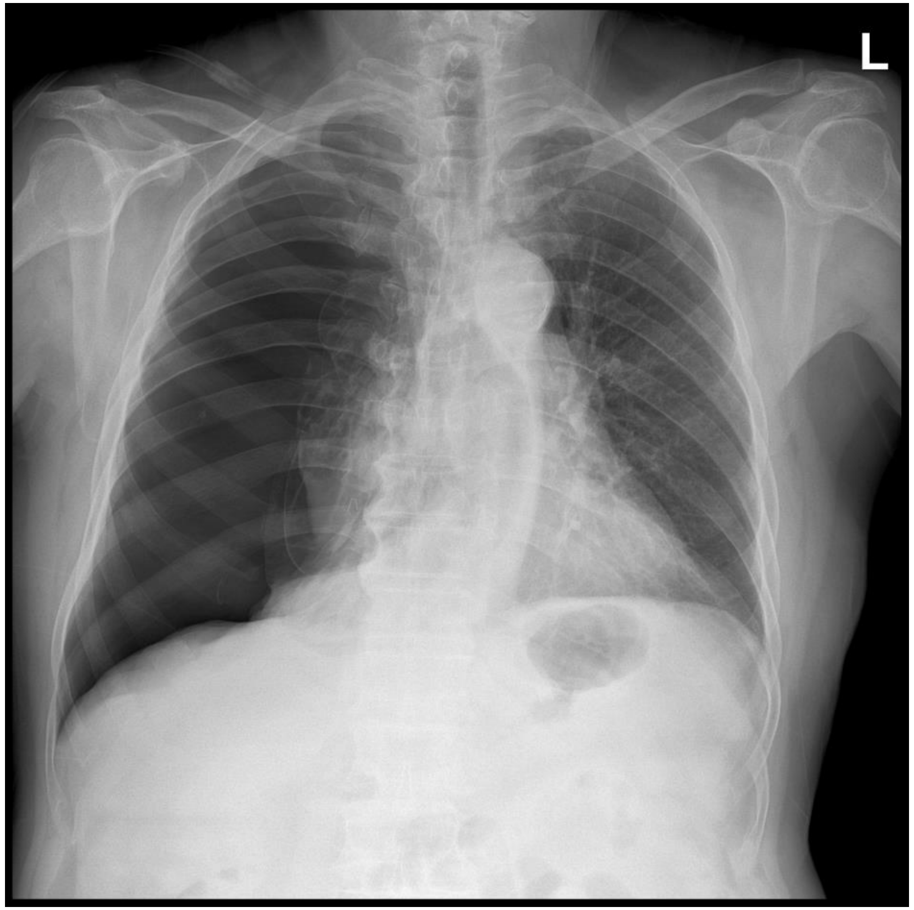
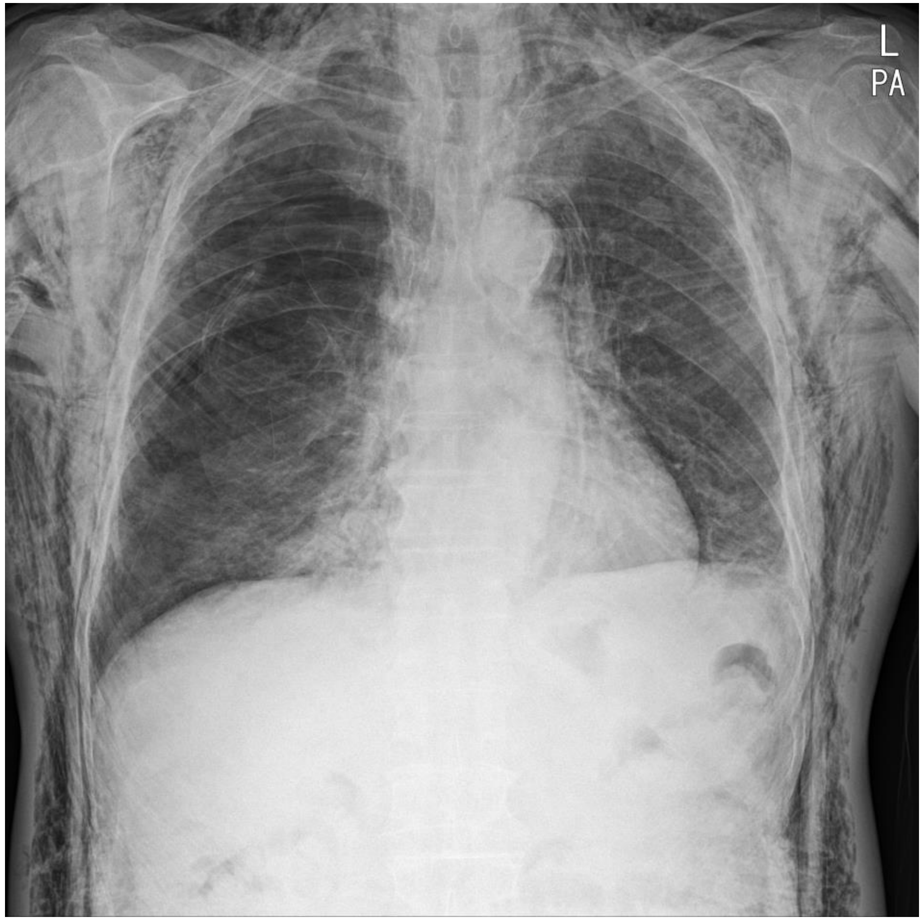
- 타병원에서 흉관삽입술 이후 2주 이상 air leakage 지속되어 전원.





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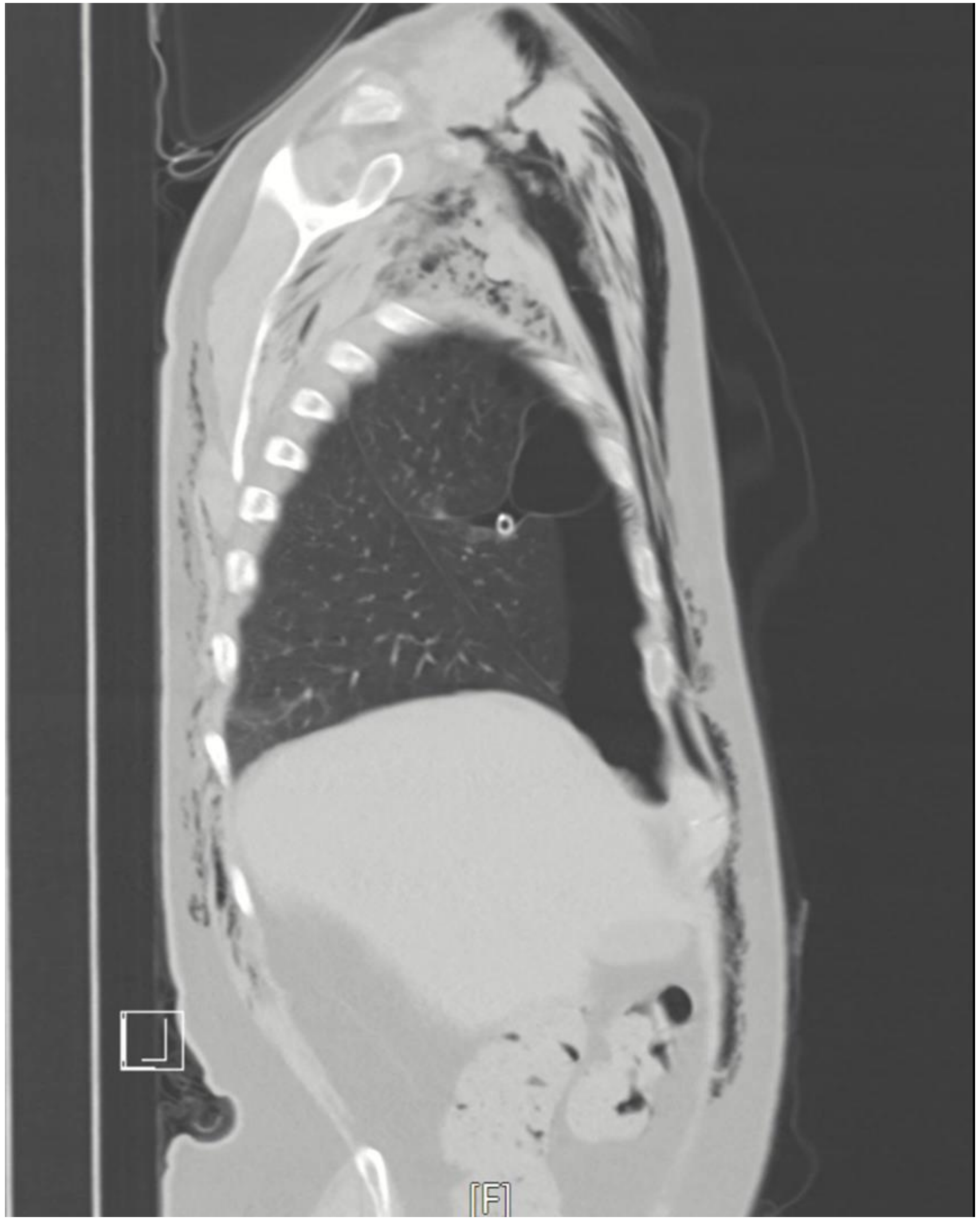

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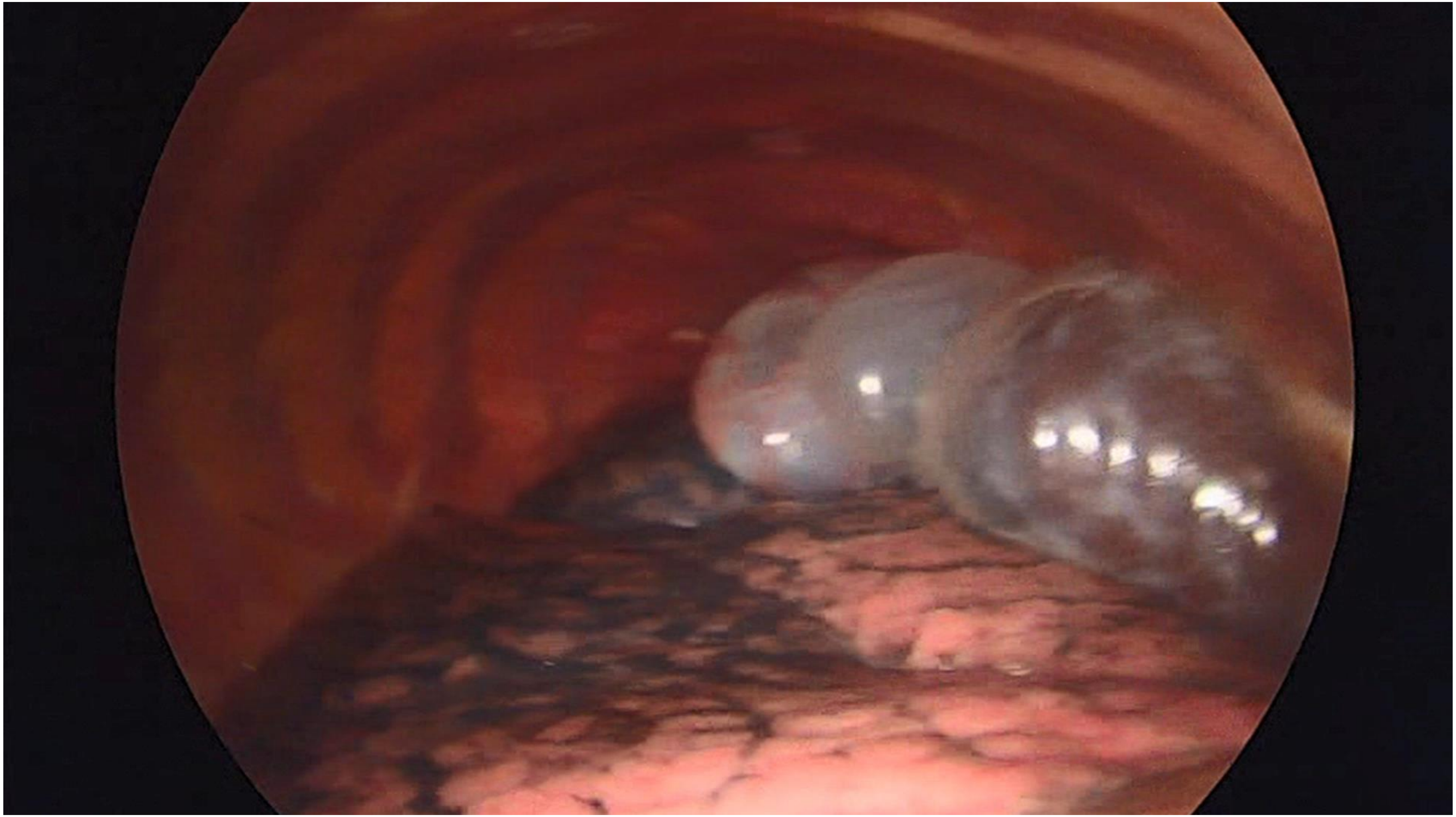

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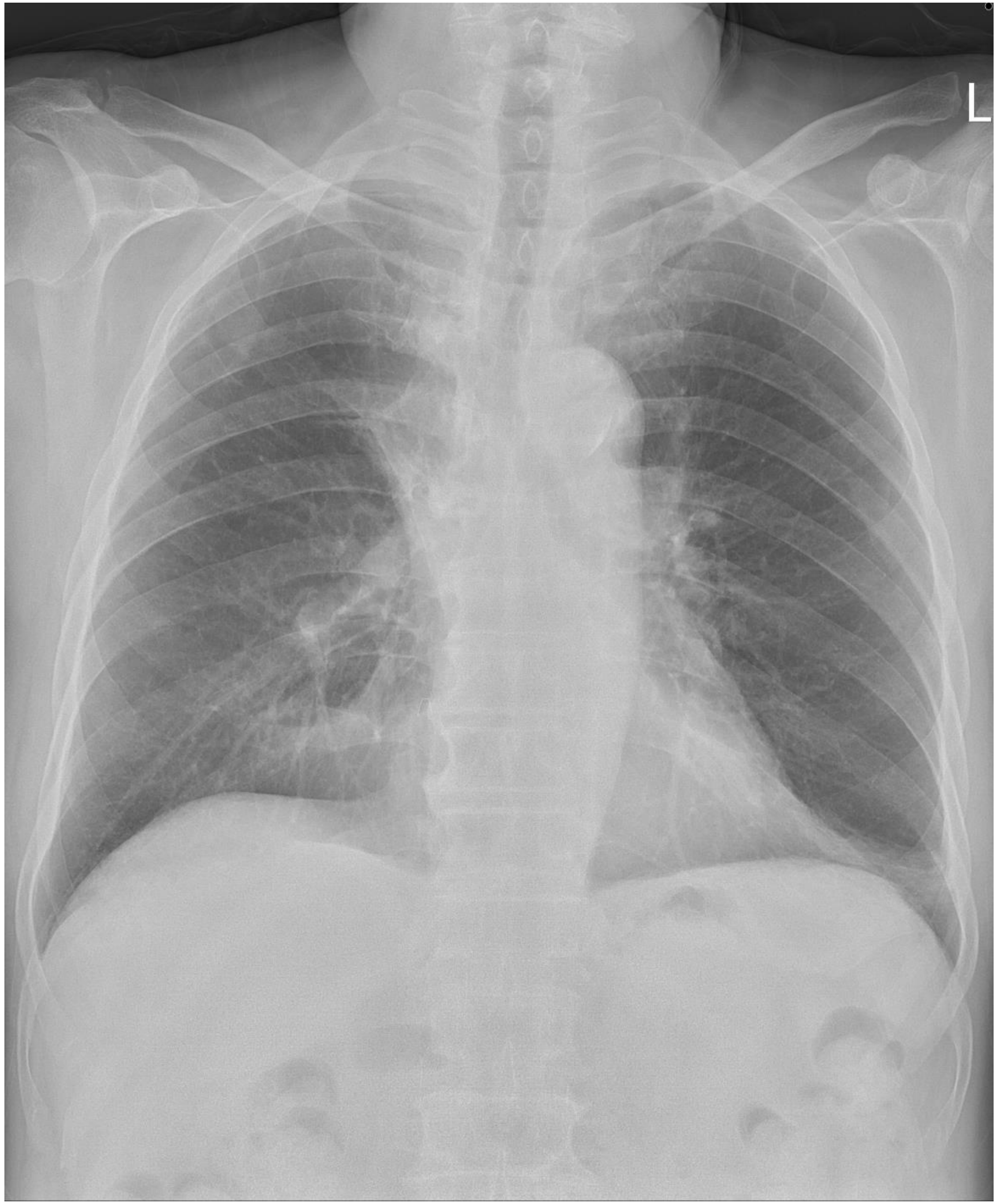

수술

Original Article

Safety and usability of an endo staple line reinforcement device for pulmonary resections

Kenneth A. Kesler[1], David Zeltsman[2], Linda W. Martin[3], Emily Cassidy[4], Andrew Wheeler[5], Zane Hammoud[6], Andrew Popoff[6], Jo-El Baudendistel[7], Paula P. Veldhuis[7]^, Mordechai G. Sadowsky[7]

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Contributions: (I) Conception and design: KA Kesler, D Zeltsman, LW Martin, E Cassidy, A Wheeler, Z Hammoud, A Popoff; (II) Administrative support: JE Baudendistel, PP Veldhuis; (III) Provision of study materials or patients: JE Baudendistel; (IV) Collection and assembly of data: JE Baudendistel; (V) Data analysis and interpretation: KA Kesler, D Zeltsman, LW Martin, E Cassidy, A Wheeler, Z Hammoud, A Popoff, PP Veldhuis, MG Sadowsky; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Background: Pulmonary resection can present technical challenges for surgeons due to the dissection and closure of tissues, which vary in thickness and elastic properties, occasionally leading to prolonged air leaks. Staple line reinforcements (SLRs) are widely utilized tools for fortifying the stability and integrity of closures in thoracic surgery, however, materials available and ease of use for both surgeon and scrub nurse have been suboptimal. A novel "click-and-go" device pre-loaded with bioabsorbable buttress material was recently developed, the Echelon Endopath SLR (ESLR, Ethicon, Inc., Cincinnati, OH, USA). This prospective study examines the safety and efficacy of this novel device in lung resections.

Methods: Adult surgical candidates undergoing primary pulmonary resection (both open and thoracoscopic) where the ESLR would be used were enrolled. Exclusion included reoperation/revision in same anatomical location, hypersensitivity to polyglactin or related products, and body mass index (BMI) ≥46.0 kg/m^2. The primary endpoint assessed the incidence of specific device-related adverse events (AEs): prolonged air leak and empyema. Additional endpoints included number of devices replaced during surgery due to slippage or bunching, and surgeon-reported usability responses. Data was summarized for AEs deemed device-related and usability questionnaire responses.

Results: A total of 131 subjects were included in the primary endpoint analysis data set with 120 subjects completing the study (91.6%). The mean age at consent was 62.8±12.0 years and 55.7% were female. The most common primary indication for the procedure was malignancy 61.1%, and primary non-malignant lung disease (non-chronic obstructive pulmonary disease) 12.2%. Common procedures performed were wedge resection (58.0%) and lobectomy (34.4%). There were zero reported device-specific/-related AEs which counted toward the primary endpoint. Responses from a usability questionnaire found all surgeons (100.0%) reported the ease of setup was superior to previous devices utilized. Surgeons expressed greater confidence in the buttress material of the ESLR than that of previous SLR devices (strongly agree 88.9%; slightly agree 11.1%). Most also felt that there was less wastage with the click-and-go ESLR (strongly agree 77.8%, slightly agree 11.1%, neutral 11.1%).

Conclusions: The ESLR device demonstrates safe and effective performance in this post-market study of specific thoracic procedures. Furthermore, surgeons found this was easier to use.

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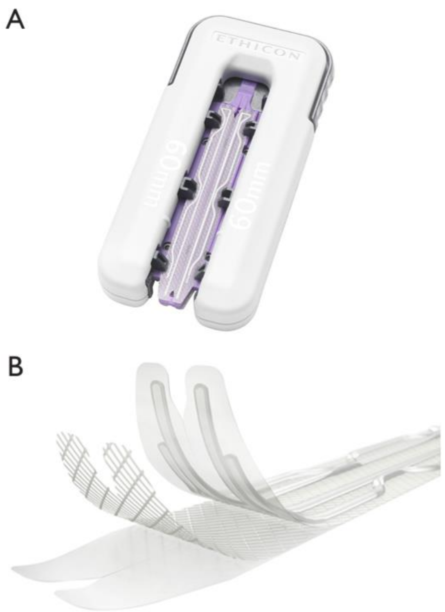

Figure 1 Echelon Endopath Staple Line Reinforcement device with bioabsorbable buttressing material.

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